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## Index

# About This Manual

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This manual describes the intrinsic, portability, POSIX, and QuickWin library functions and procedures of the Intel® Fortran libraries for both IA-32 and Itanium architectures. Wherever the interface is different for the architectures, the difference is described. If not different (default), the description is applicable to two architectures.

The intrinsic, portability, and POSIX libraries documented in this manual can be used for both Windows and Linux platforms, the differences, if any, are explained.

For managing and linking libraries with Intel Fortran Compiler, see “Libraries” section in the *Intel® Fortran Compiler User’s Guide*.

This manual is organized as follows:

Chapter 1	Describes the Intel Fortran intrinsic functions
Chapter 2	Describes the portability functions
Chapter 3	Describes the POSIX functions
Chapter 4	Describes QuickWin run-time library functions

## Related Publications

The following documents provide additional information relevant to the Intel Fortran 95 Language:

The following documents provide additional information relevant to the Intel Fortran Compiler:

- *Fortran 95 Handbook*, Jeanne C. Adams, Walter S. Brainerd, Jeanne T. Martin, Brian T. Smith, and Jerrold L. Wagener. The MIT Press, 1997. Provides a comprehensive guide to the standard version of the Fortran 95 Language
- *Fortran 90/95 Explained*, Michael Metcalf and John Reid. Oxford University Press, 1996. Provides a concise description of the Fortran 95 language.
- *Fortran 90/95 for Scientists and Engineers*, S. Chapman; McGraw-Hill
- For Win32-specific information, see the documentation included with the *Microsoft Win32 Software Development Kit*.
- For Microsoft Fortran PowerStation 32 information, see the documentation included with the *Microsoft Fortran Powerstation 32 Development System for Windows NT, Version 1.0*.

Information about the target architecture is available from Intel and from most technical bookstores. Some helpful titles are:

- *Intel® Fortran Programmer's Reference*
- *Intel® Fortran Compiler User's Guide*
- *Intel® C/C++ Compiler User's Guide*
- *Intel® Architecture Optimization Reference Manual*, Intel Corporation, doc. number 245127
- *Intel Processor Identification with the CPUID Instruction*, doc number 241618

Most Intel documents are also available from the Intel Corporation web site at *developer.intel.com*

## Notational Conventions

This manual uses the following conventions:

This type style	indicates an element of syntax, a reserved word, a keyword, a filename, computer output, or part of a program example. The text appears in lowercase unless uppercase is significant.
THIS TYPE STYLE	Fortran source text appears in upper case.



	1 is lowercase letter L in examples. 1 is the number 1 in examples. O is the uppercase O in examples. 0 is the number 0 in examples.
<b>This type style</b>	indicates the exact characters you type as input.
<i>This type style</i>	indicates a place holder for an identifier, an expression, a string, a symbol, or a value. Substitute one of these items for the place holder.
[ <i>items</i> ]	items enclosed in brackets are options.
{ <i>item</i>   <i>item</i> }	Select only one of the items listed between braces. A vertical bar (   ) separates the items.
...	Ellipses indicate that you can repeat the preceding item.
<b>This type style</b>	indicates an Intel Fortran Language extension format.
<b>This type style</b>	indicates an Intel Fortran Language extension discussion. Throughout the manual, <b>extensions</b> to the ANSI standard Fortran language appear in <b>this font and color</b> to help you easily identify when your code uses a non-standard language extension.



# *Intrinsic Procedures*

---

# 1

Intrinsic procedures are built-in functions and subroutines that are available by default to every Fortran 95 program and procedure. (If certain conditions are met, an intrinsic procedure can be made unavailable; see [Availability of Intrinsic Procedures](#).)

This chapter describes the intrinsic procedures provided by Intel® Fortran. All intrinsic procedures defined by the Fortran 95 Standard are supported in Intel Fortran. In addition, Intel Fortran supports other nonstandard intrinsic procedures to extend the language's functionality; see the section [Nonstandard Intrinsic Procedures](#). Intel Fortran intrinsic procedures are provided in the library `libintrins.lib`.

The *Intel® Fortran Compiler User's Guide* has more detailed information about the libraries that are shipped with Intel Fortran and the other libraries used by the `ifl` compiler driver, including the `portlib` and `posix` libraries. The `portlib` and `posix` libraries are described in detail in Chapter 2 and Chapter 3 of this manual.

## **Overview of Intrinsic Procedures**

This section explains the situations under which intrinsic procedures are not available, gives an overview of Intel Fortran intrinsic functions and subroutines, describes the use of the `INTRINSIC` attribute and statement, and discusses nonstandard intrinsic procedures.

## Availability of Intrinsic Procedures

An intrinsic procedure is available in every program unit—except when the intrinsic’s name is defined by the user to have a different meaning, such as a representing a user-defined procedure, variable, or constant.

User-defined procedures always take precedence over intrinsic procedures of the same name when the user-defined procedure’s definition is visible. This happens, for example, when the user-defined procedure has an explicit interface, is in an `EXTERNAL` statement, or is a statement function.

Both a user-defined procedure and an intrinsic may have the same name if the user-defined procedure is used to `EXTEND` a generic intrinsic and the argument types differ.

An intrinsic function is not available when the function’s name has been given the `EXTERNAL` attribute.

## Intrinsic Subroutines and Functions

Intrinsic procedures include both intrinsic functions and intrinsic subroutines.

An intrinsic subroutine is invoked by the `CALL` statement and can return values through arguments passed to it. An intrinsic function is referenced as part of an expression and upon evaluation returns a value (the “function value”), which is used in the expression.

Intrinsic procedures are identified as either functions or subroutines as part of their “class” identification.

Intrinsic subroutines can be further classified as either elemental or nonelemental subroutines.

Intrinsic functions include the following classes:

- [Elemental Functions](#)
- [Inquiry Functions](#)
- [Transformational Functions](#)

An intrinsic function can be referenced by either a generic name, a specific name, or both; for details see the section “[Generic and Specific Intrinsic Function Names](#)”.

Each intrinsic’s class is noted in the list of intrinsic specifications later in this chapter (see “[Intrinsic Procedure Specifications](#)”).

## Intrinsic Subroutines

Subroutine references are made by means of the `CALL` statement. Any values returned by an intrinsic subroutine are provided through the subroutine’s argument(s).

The sample code segment that follows calls the intrinsic subroutine `DATE_AND_TIME` to get real-time clock and date data, which `DATE_AND_TIME` returns by means of the argument `Dtime`.

```
INTEGER Dtime(8)
CALL DATE_AND_TIME (VALUES=Dtime)
PRINT *, Dtime(1)           ! print the year
```

## Elemental and Nonelemental Subroutines

Intrinsic subroutines include both elemental and nonelemental subroutines.

`MVBITS` is the only elemental subroutine. All other intrinsic subroutines are nonelemental.

`MVBITS` is elemental in that it allows arrays to be used as arguments in the same way that scalar arguments are specified. It has all scalar dummy arguments but permits conformable arrays to be passed as actual arguments. The effect is as if the scalar form of the subroutine were called for each corresponding element of the actual argument arrays supplied.

## Intrinsic Functions

A function differs from a subroutine in that a function returns a value, and a function reference is part of an expression (not a complete statement). Each function returns its result as the function value. This value is used in the expression that references the function.

A function reference may occur wherever an expression is allowed. For instance, intrinsic functions may be used in the right-hand side of assignment statements, as arguments to procedures, in output lists, and elsewhere.

In the following segment of code, the `SIN` intrinsic function is evaluated, then its result is printed:

```
Ar = N*Pi/180      ! angle in radians
PRINT *, SIN(Ar)   ! print sine of angle
```

The statement below assigns the product of `Y` and the sine of `X` to the variable `Sxy`:

```
Sxy = SIN(X) * Y
```

### Generic and Specific Intrinsic Function Names

There are two varieties of intrinsic function names: generic names and specific names. Each intrinsic function has either a generic name, one or more specific names, or both generic and specific names. If both a generic and specific name exist for an intrinsic function, either may be used to invoke it.

The “[Generic and Specific Intrinsic Summary](#)” section later in this chapter lists a summary of generic intrinsic functions and their corresponding specific routines (see [Table 1-3](#)).

When you reference a generic intrinsic name, the data type of the actual arguments determine which specific intrinsic is invoked. A reference to a specific intrinsic name requires the intrinsic’s actual arguments to be of a certain data type.

For instance, the generic intrinsic function `ABS` can accept arguments of any numeric type. However, a specific version of the intrinsic, `DABS`, can accept only double precision arguments.

An intrinsic name can be both generic and specific. For example, as shown in [Table 1-3](#), when the intrinsic procedure `SIN` is called with a double precision argument the specific function `DSIN` is invoked. When `SIN` is called with a `REAL` argument, however, the specific function `SIN` is invoked.

Using a generic name can, in general, simplify the referencing of intrinsic functions, because the generic name can be specified for multiple types of arguments.

## Elemental Functions



---

**NOTE.** *Some command-line options specify different default data type sizes and can cause different or invalid intrinsic procedure references. For details see the section “Data type sizes and command-line options”.*

---

Elemental intrinsic functions allow arrays to be used as arguments in the same way that scalar arguments are specified.

An elemental function that is called with all scalar dummy arguments delivers a scalar result. Calling an elemental function with conformable array arguments, however, results in a conformable array result. The effect is as if a scalar form of the function were called for each corresponding element of the actual argument arrays supplied.

If both array and scalar arguments are specified to an elemental function, each scalar is treated as an array in which all elements have the scalar value. The “scalar array” is conformable with the array arguments.

The following segment of code illustrates how the elemental intrinsic function ABS can be called with both scalar arguments (such as N) and array arguments (such as X).

```
INTEGER N, Nabs
REAL X(5), Xabs(5)
N = -5
Nabs = ABS(N)
X = (/ -4.5, 5.2, -3.9, -1.1, 8.7 /)
Xabs = ABS(X)
```

After the calls to ABS, *Nabs* has the value 5, and the array *Xabs* has the value [4.5 5.2 3.9 1.1 8.7].

## Inquiry Functions

Inquiry intrinsic functions return information based on their arguments’ properties (and not its arguments’ values).

The following statements illustrate how the `SIZE` inquiry function returns information about a property of the array `A`:

```
REAL A(3:9, 4:10)
INTEGER SizA
SizA = SIZE(A)
```

The `SIZE` intrinsic function returns either the extent of an array along one dimension or the total number of elements in the array. Because `SIZE` is an inquiry intrinsic function, only the array's properties, and not the values of the elements of the array, are considered.

Following the call to `SIZE`, the variable `SizA` has a value of 49; that is, the total number of elements in array `A` is 49.

## Transformational Functions

Transformational intrinsic functions include all functions that are not elemental and are not inquiry functions.

In general, transformational functions require at least one array argument, and return either a scalar or array result based on actual arguments that cannot be evaluated elementally. Often, an array result will be of a different shape than the argument(s).

The following code segment makes use of the `ANY` and `ALL` transformational intrinsics.

```
INTEGER(4) A(5), B(5)
LOGICAL L1, L2
A = (/3, 5, 7, 9, 9/)
B = (/3, 4, 7, 8, 9/)
L1 = ANY(A .EQ. B)
L2 = ALL(A .EQ. B)
```

The `ANY` and `ALL` intrinsics functions determine whether any value or all values are `.TRUE.` along dimensions of a logical array.

In the above code, the actual argument passed to `ANY` and `ALL` is a five-element logical array. This array, which is the result of the expression `A .EQ. B`, has the value `[.TRUE., .FALSE., .TRUE., .FALSE., .TRUE.]`.



After the above statements are evaluated, the logical variable `L1` has the value `.TRUE.` (at least one element of `A` is equal to the corresponding element of `B`) and `L2` has the value `.FALSE.` (not all elements of `A` are equal to the corresponding elements of `B`).

## INTRINSIC Attribute and Statement

Both the `INTRINSIC` attribute and the `INTRINSIC` statement specify that a name is a specific or generic name of an intrinsic procedure. The `INTRINSIC` and `EXTERNAL` attributes are mutually exclusive.

The `INTRINSIC` attribute and statement typically are used either to document procedures that are intrinsic or to pass intrinsic procedures as actual arguments.

Functions may be declared intrinsic either in an `INTRINSIC` statement or in a type declaration statement using the `INTRINSIC` attribute. Such a declaration may occur only once per name.

Intrinsic subroutine names can be declared intrinsic only by using the `INTRINSIC` statement. The `INTRINSIC` attribute cannot be applied to a subroutine because subroutine names cannot appear in type statements.

## Documenting Intrinsic Procedures

The `INTRINSIC` attribute and statement can be used as documentation techniques to indicate that a name is that of an intrinsic procedure.

This can be useful to other people who will use your code, especially in code where you invoke nonstandard intrinsic procedures.

## Intrinsic Procedures as Actual Arguments

Intrinsic procedures may be passed as actual arguments to subroutines and functions. Only the names of specific intrinsic procedures may be passed, and the compiler must know that the name being passed is that of an intrinsic.

When an intrinsic procedure is used as an actual argument and its name does not appear elsewhere in the same scoping unit, the intrinsic must be declared intrinsic. This can be done with the `INTRINSIC` attribute (for intrinsic functions) or the `INTRINSIC` statement (for subroutines and functions).

For example, if the statement

```
CALL My_Subroutine(QSIN)
```

appears in a program unit and no other occurrence of `QSIN` appears, the compiler assumes that `QSIN` is a variable and is not the specific name of the intrinsic function `SIN`. For this reason, `QSIN` must be declared intrinsic to ensure that the intrinsic function is passed.




---

**NOTE.** *Some intrinsic procedures can never be used as actual arguments.*

---

The following example code shows how the `SIN` and `COS` intrinsic functions can be passed to the user-written subroutine `My_Subroutine`.

```
PROGRAM Example
REAL(4), INTRINSIC :: SIN, COS
CALL My_Subroutine(SIN)
CALL My_Subroutine(COS)
END

SUBROUTINE My_Subroutine(TrigRtn)
REAL(4), EXTERNAL :: TrigRtn
REAL(4), PARAMETER :: Pi=3.1415926
INTEGER I
DO I=0, 360, 45
    ! Convert degrees to
    ! radians (I*Pi/180) and
    ! call the intrinsic routine
    ! passed as TrigRtn.
    WRITE(6, 100) I, " degrees ", TrigRtn(I*Pi/180)
END DO
```

```
100 FORMAT (I4, A9, F12.8)
END
```

Using the `INTRINSIC` attribute, both functions are declared intrinsic in a type declaration statement in the main program unit.

Similarly, in the subroutine, the `EXTERNAL` attribute specifies that the dummy argument `TrigRtn` is the name of a function, not the name of a data object.

## Nonstandard Intrinsic Procedures

In addition to supporting all intrinsic procedures defined by the Fortran 95 Standard, Intel Fortran provides additional intrinsic procedures that are nonstandard. The nonstandard intrinsics, like the Standard intrinsics, are part of the Intel Fortran language and are not selected or unselected by command-line options.

For a list of nonstandard intrinsic routine names, see [Table 1-3](#). All intrinsic procedures, including all nonstandard procedures, are described in the section “[Intrinsic Procedure Specifications](#)”.

The nonstandard intrinsics are included to provide additional functionality not defined in the Standard, to provide compatibility with other Fortran 95 implementations, and to provide specific routines for data types beyond those in the Standard.



---

**NOTE.** *Using Intel-supplied nonstandard intrinsic procedures in your code may limit its portability. Other vendors' compilers may not support Intel-supplied nonstandard intrinsics.*

---

In Intel Fortran, nonstandard intrinsic procedures are supported in the same manner as Standard intrinsics; that is, the routines' generic property, types, and dummy argument attributes are known to the Intel compiler.

The `INTRINSIC` statement allows a non-Intel Fortran compiler, which may not support Intel nonstandard intrinsics, to immediately indicate if the marked procedures are not recognized as an intrinsic routine.

## Data Representation Models

The Fortran 95 Standard specifies data representation models that suggest how data are represented in the computer and how computations are performed on the data. The computations performed by some Fortran 95 intrinsic functions are described in terms of these models.

There are three data representation models in Fortran 95:

- [The Bit Model](#)
- [The Integer Number System Model](#)
- [The Real Number System Model](#)

In a given implementation the model parameters are chosen to match the implementation as closely as possible. However, an exact match is not required and the model does not impose any particular arithmetic on the implementation.

## Data Representation Model Intrinsics

Several intrinsic functions provide information about the three data representation models. These intrinsic are listed in Table 1-1.

**Table 1-1 Intrinsic Functions Related to Data Representation Models**

Intrinsic function	Description
<a href="#">BIT_SIZE(I)</a>	Number of bits in an integer of the kind of I (I is an object, not a kind number)
<a href="#">DIGITS(X)</a>	Base digits of precision in integer or real model for x
<a href="#">EPSILON(X)</a>	Small value compared to 1 in real model for x
<a href="#">EXPONENT(X)</a>	Real model exponent value for x
<a href="#">FRACTION(X)</a>	Real model fraction value for x
<a href="#">HUGE(X)</a>	Largest model number in integer or real model for x
<a href="#">MAXEXPONENT(X)</a>	Maximum exponent value in real model for x
<a href="#">MINEXPONENT(X)</a>	Minimum exponent value in real model for x

continued

**Table 1-1      Intrinsic Functions Related to Data Representation Models**

Intrinsic function	Description
<u>NEAREST(X, S)</u>	Nearest processor real value
<u>PRECISION(X)</u>	Decimal precision in real model for x
<u>RADIX(X)</u>	Base (radix) in integer or real model for x
<u>RANGE(X)</u>	Decimal exponent range in integer or real model for x
<u>RRSPACING(X)</u>	1/(relative spacing near x)
<u>SCALE(X, I)</u>	x with real model exponent changed by I
<u>SET_EXPONENT(X, I)</u>	Set the real model exponent of x to I
<u>SPACING(X)</u>	Absolute spacing near x
<u>TINY(X)</u>	Smallest number in real model for x
<u>DIGITS(X)</u>	Base digits of precision in integer or real model for x

### The Bit Model

The bit model interprets a nonnegative scalar data object *a* of type integer as a sequence of binary digits (bits), based upon the model

$$a = \sum_{k=0}^{n-1} b_k 2^k$$

where *n* is the number of bits, given by the intrinsic function `BIT_SIZE` and each *b<sub>k</sub>* has a bit value of 0 or 1. The bits are numbered from right to left beginning with 0.

### The Integer Number System Model

The integer number system is modeled by

$$i = \sum_{k=0}^{q-1} d_k r^k$$

where

$i$	is the integer value
$s$	is the sign (+1 or -1)
$r$	is the radix given by the intrinsic function <code>RADIX</code> (always 2 for Intel® systems)
$q$	is the number of digits (integer greater than 0), given by the intrinsic function <code>DIGITS</code>
$dk$	is the $k$ th digit and is an integer $0 \leq d_k < r$ . The digits are numbered left to right, beginning with 1.

## The Real Number System Model

The real number system is modeled by

$$x = s b^e \sum_{k=1}^p f_k b^{Dk}$$

where

$x$	is the real value
$s$	is the sign (+1 or -1)
$b$	is the base (real radix) and is an integer greater than 1, given by the intrinsic function <code>RADIX</code> (always 2 for Intel systems)
$e$	is an integer between some minimum value ( <i>lmin</i> ) and maximum value ( <i>lmax</i> ), given by the intrinsic functions <code>MINEXPONENT</code> and <code>MAXEXPONENT</code>
$p$	is the number of mantissa digits and is an integer greater than 1, given by the intrinsic function <code>DIGITS</code>
$f_k$	is the $k$ th digit and is an integer $0 \leq f_k < b$ , but $f_1$ may be zero only if all the $f_k$ are zero. The digits are numbered left to right, beginning with 1.

## Functional Categories of Intrinsic Procedures

A listing of intrinsic procedures, ordered alphabetically by category, appears in Table 1-2. More complete information on the individual intrinsic procedures is provided in the section “[Intrinsic Procedure Specifications](#)”.

**Table 1-2      Intrinsic Procedures by Category**

Category	Intrinsic Routines
Array construction	MERGE, PACK, SPREAD, UNPACK
Array inquiry	ALLOCATED, LBOUND, SHAPE, SIZE, UBOUND
Array location	MAXLOC, MINLOC
Array manipulation	CSHIFT, EOSHIFT, TRANSPOSE
Array reduction	ALL, ANY, COUNT, MAXVAL, MINVAL, PRODUCT, SUM
Array reshape	RESHAPE
Bit inquiry	BIT_SIZE
Bit manipulation	BTEST, IAND, IBCLR, IBITS, IBSET, IEOR, IOR, ISHFT, ISHFTC, MVBITS, NOT
Character computation	ACHAR, ADJUSTL, ADJUSTR, CHAR, IACHAR, ICHAR, INDEX, LEN_TRIM, LGE, LGT, LLE, LLT, REPEAT, SCAN, TRIM, VERIFY
Character inquiry	LEN
Floating-point manipulation	EXPONENT, FRACTION, NEAREST, RRSPACING, SCALE, SET_EXPONENT, SPACING
Kind	KIND, SELECT_INT_KIND, SELECTED_REAL_KIND
Logical	LOGICAL
Mathematical computation	ACOS, ASIN, ATAN, ATAN2, COS, COSH, EXP, LOG, LOG10, SIN, SINH, SQRT, TAN, TANH
Matrix multiply	MATMUL
Nonstandard intrinsic procedures	ACOSD, ACOSH, AND, ASIND, ASINH, ATAN2D, ATAND, ATANH, BADDRESS, COSD, DCMPLX, DFLOAT, DNUM, DREAL, FREE, HFIX, IACHAR, IADDR, IDIM, IJINT, IMAG, INT1, INT2, INT4, INT8, INUM, ISIGN, ISNAN, IXOR, JNUM, LOC, LSHFT, LSHIFT, MALLOC, MCLOCK, OR, QNUM, QPROD, RNUM, RSHFT, RSHIFT, SIND, TAND, XOR

continued

**Table 1-2      Intrinsic Procedures by Category** (continued)

Category	Intrinsic Routines
Numeric computation	ABS, AIMAG, AINT, ANINT, CEILING, CMPLX, CONJG, DBLE, DIM, DPROD, FLOOR, INT, MAX, MIN, MOD, MODULO, NINT, REAL, SIGN
Numeric inquiry	DIGITS, EPSILON, HUGE, MAXEXPONENTS, MINEXPONENTS, PRECISION, RADIX, RANGE, TINY
Pointer inquiry	ASSOCIATED
<a href="#">Prefetching</a>	<a href="#">MM_PREFETCH</a>
Presence inquiry	PRESENT
Pseudorandom number	RANDOM_NUMBER, RANDOM_SEED
Time	DATE_AND_TIME, SYSTEM_CLOCK
Transfer	TRANSFER
Vector multiply	DOT_PRODUCT

## Generic and Specific Intrinsic Summary

As mentioned earlier in the section “[Generic and Specific Intrinsic Function Names](#),” each intrinsic procedure may have a generic name, one or more specific names, or both generic and specific names. All standard and nonstandard generic and specific intrinsic procedures supported by Intel Fortran are summarized in [Table 1-3](#).



## Summary of Generic and Specific Intrinsic Names

[Table 1-3](#) lists a summary of generic and specific intrinsic procedures. The table's listing is alphabetically ordered.

The class information indicates whether an intrinsic is an extension to the Fortran 95 Standard (Nonstandard). These procedures provide nonstandard behavior. Functions whose names and descriptions appear in this color are also extensions to the Fortran 95 standard.

The class information also indicates which intrinsic procedures are subroutines, which are functions, and whether they are specific or generic. When a number appears in parentheses after a type, such as `INTEGER`, the number represents the `KIND` value.

**Table 1-3 Generic and Specific Intrinsic Procedures**

Intrinsic Procedure	Description
ABS	<p>Absolute value.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre> generic ABS(A)     INTEGER(1) function BABS(A)         INTEGER(1) ::A     INTEGER(2) function HABS(A)         INTEGER(2) ::A     INTEGER function IABS(A)         INTEGER ::A     INTEGER(8) function ABS(A)         INTEGER(8) ::A     REAL function ABS(A)         REAL ::A     DOUBLE PRECISION function DABS(A)         DOUBLE PRECISION ::A     REAL function CABS(A)         COMPLEX ::A     DOUBLE PRECISION function CDABS(A)         DOUBLE COMPLEX ::A     DOUBLE PRECISION function ZABS(A)         DOUBLE COMPLEX ::A     REAL(16) function QABS(X)         REAL(16) :: X     COMPLEX(16) function CQABS(X)         COMPLEX(16) ::X end </pre>

continued

Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
ACHAR	<div>Return character corresponding to ASCII value.</div> <div><b>Class.</b> generic elemental function</div> <div><b>Summary.</b></div> <div>generic ACHAR(I) CHARACTER function ACHAR(I) INTEGER(1) ::I CHARACTER function ACHAR(I) INTEGER(2) ::I CHARACTER function ACHAR(I) INTEGER(4) ::I CHARACTER function ACHAR(I) INTEGER(8) ::I  end</div>
ACOS	<div>Arccosine function in radians.</div> <div><b>Class.</b> generic elemental function</div> <div><b>Summary.</b></div> <div>generic ACOS(X) REAL function ACOS(X) REAL ::X DOUBLE PRECISION function DACOS(X) DOUBLE PRECISION::X REAL(16) function QACOS(X) QACOS(X) REAL(16) X  end</div>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
ACOSD	<p>Arccosine function in degrees.</p> <p><b>Class.</b> generic elemental nonstandard function</p> <p><b>Summary.</b></p> <pre> generic ACOSD(X)     REAL function ACOSD(X)         REAL(4) ::X     DOUBLE PRECISION function DACOSD(X)         DOUBLE PRECISION ::X     REAL(16) function QACOSD(X) QACOSD(X)         REAL(16) X  end </pre>
ACOSH	<p>Hyperbolic arccosine of radians.</p> <p><b>Class.</b> generic elemental nonstandard function</p> <p><b>Summary.</b></p> <pre> generic ACOSH(X)     REAL function ACOSH(X)         REAL(4) ::X     DOUBLE PRECISION function DACOSH(X)         DOUBLE PRECISION ::X     REAL(16) function QACOSH(X)         REAL(16) ::X  end </pre>

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
ADJUSTL	<p>Adjust string to left, removing leading blanks.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre>generic ADJUSTL(STRING)     CHARACTER function     ADJUSTL(STRING)         CHARACTER ::STRING     end</pre>
ADJUSTR	<p>Adjust string to right, removing trailing blanks.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre>generic ADJUSTR(STRING)     CHARACTER function     ADJUSTR(STRING)         CHARACTER ::STRING     end</pre>
AIMAG	<p>Imaginary part of a complex number.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre>generic AIMAG(Z)     REAL function AIMAG(Z)         COMPLEX ::Z     DOUBLE PRECISION function     DIMAG(Z)         DOUBLE COMPLEX ::Z     QIMAG(Z)         COMPLEX*32 ::Z     end</pre>
AIMAX0	see <a href="#">“MAX(A1, A2, A3, …)”</a>
AIMIN0	see <a href="#">“MIN(A1, A2, A3, …)”</a>

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
AINT	Truncation to a whole number. <b>Class.</b> generic elemental function <b>Summary.</b> generic AINT(A,KIND) REAL(4) function AINT(A,KIND) REAL(4) ::A INTEGER,OPTIONAL ::KIND REAL(8) function DINT(A) REAL (8)::A REAL(16) function QINT(A) REAL(16) ::A  end
AJMAX0	see <a href="#"><u>"MAX(A1, A2, A3, ...)"</u></a>
AJMIN0	see <a href="#"><u>"MIN(A1, A2, A3, ...)"</u></a>
AKMAX0	see <a href="#"><u>"MAX(A1, A2, A3, ...)"</u></a>
AKMIN0	see <a href="#"><u>"MIN(A1, A2, A3, ...)"</u></a>

continued

Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
ALL	<div>Determine whether all values are <code>.TRUE.</code> in MASK along dimension DIM.</div> <div><b>Class.</b> generic transformational function</div> <div><b>Summary.</b></div> <div>generic ALL(MASK,DIM)<div><div>! MASK must be array-valued, DIM must be scalar</div><div>LOGICAL(1) function</div><div>ALL(MASK,DIM)<div>LOGICAL(1) :: MASK</div><div>INTEGER,OPTIONAL::DIM</div></div><div>LOGICAL(2) function</div><div>ALL(MASK,DIM)<div>LOGICAL(2) :: MASK</div><div>INTEGER,OPTIONAL::DIM</div></div><div>LOGICAL(4) function</div><div>ALL(MASK,DIM)<div>LOGICAL(4) :: MASK</div><div>INTEGER,OPTIONAL::DIM</div></div><div>LOGICAL(8) function</div><div>ALL(MASK,DIM)<div>LOGICAL(8) :: MASK</div><div>INTEGER,OPTIONAL::DIM</div></div></div><div>end</div></div>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
ALLOCATED	<p>Indicate whether an allocated array is currently allocatable.</p> <p><b>Class.</b> generic inquiry function</p> <p><b>Summary.</b></p> <pre> generic ALLOCATED (ARRAY)     ! ARRAY must be an allocatable array     LOGICAL function     ALLOCATED (ARRAY)         INTEGER(1) :: ARRAY     LOGICAL function     ALLOCATED (ARRAY)         INTEGER(2) :: ARRAY     LOGICAL function     ALLOCATED (ARRAY)         INTEGER(4) :: ARRAY     LOGICAL function     ALLOCATED (ARRAY)         INTEGER(8) :: ARRAY     LOGICAL function     ALLOCATED (ARRAY)         REAL(4) :: ARRAY     LOGICAL function     ALLOCATED (ARRAY)         REAL(8) :: ARRAY     LOGICAL function     ALLOCATED (ARRAY)         COMPLEX(4) :: ARRAY     LOGICAL function     ALLOCATED (ARRAY)         COMPLEX(8) :: ARRAY     LOGICAL function     ALLOCATED (ARRAY) </pre>

continued



**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
ALLOCATED - continued	LOGICAL(1) ::ARRAY LOGICAL function ALLOCATED(ARRAY) LOGICAL(2) ::ARRAY LOGICAL function ALLOCATED(ARRAY) LOGICAL(4) ::ARRAY LOGICAL function ALLOCATED(ARRAY) LOGICAL(8) ::ARRAY LOGICAL function ALLOCATED(ARRAY) CHARACTER ::ARRAY LOGICAL function ALLOCATED(ARRAY) DERIVED_TYPE ::ARRAY end
ALOG	see <a href="#">“LOG(X)”</a>
ALOG10	see <a href="#">“LOG10(X)”</a>
AMAX0	see <a href="#">“MAX(A1, A2, A3, ...)”</a>
AMAX1	see <a href="#">“MAX(A1, A2, A3, ...)”</a>
AMIN0	see <a href="#">“MIN(A1, A2, A3, ...)”</a>
AMIN1	see <a href="#">“MIN(A1, A2, A3, ...)”</a>
AMOD	see <a href="#">“MOD(A, P)”</a>

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
AND	<p>Bitwise AND.</p> <p>Class. generic elemental nonstandard function</p> <p>Summary.</p> <pre>generic AND(I,J)     INTEGER(1) function AND(I,J)         INTEGER(1) ::I,J     INTEGER(2) function AND(I,J)         INTEGER(2) ::I,J     INTEGER(4) function AND(I,J)         INTEGER(4) ::I,J     INTEGER(8) function AND(I,J)         INTEGER(8) ::I,J end</pre>
ANINT	<p>Nearest whole number.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre>generic ANINT(A,KIND)     REAL(4) function ANINT(A,KIND)         REAL(4) ::A         INTEGER,OPTIONAL ::KIND     REAL(8) function DNINT(A)         REAL(8) ::A     REAL(16) function QNINT(A,KIND)         REAL(16) :: A end</pre>

continued

Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
ANY	<div>Determine whether any value is <code>.TRUE.</code> in MASK along dimension DIM.</div> <div><b>Class.</b> generic transformational function</div> <div><b>Summary.</b></div> <div>generic ANY(MASK,DIM)</div> <div>! MASK must be array-valued, DIM</div> <div>must be scalar</div> <div>LOGICAL(1) function</div> <div>ANY(MASK,DIM)</div> <div>LOGICAL(1) :: MASK;</div> <div>INTEGER,OPTIONAL::DIM</div> <div>LOGICAL(2) function</div> <div>ANY(MASK,DIM)</div> <div>LOGICAL(2) :: MASK;</div> <div>INTEGER,OPTIONAL::DIM</div> <div>LOGICAL(4) function</div> <div>ANY(MASK,DIM)</div> <div>LOGICAL(4) :: MASK;</div> <div>INTEGER,OPTIONAL::DIM</div> <div>LOGICAL(8) function</div> <div>ANY(MASK,DIM)</div> <div>LOGICAL(8) :: MASK;</div> <div>INTEGER,OPTIONAL::DIM</div> <div>end</div>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
ASIN	<p>Arcsine function in radians.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre> generic ASIN(X)     REAL function    ASIN(X)     REAL ::X     DASIN(X)     DOUBLE PRECISION ::X     QASIN(X)     REAL(16) :: X end </pre>
ASIND	<p>Arcsine function in degrees.</p> <p><b>Class.</b> generic elemental nonstandard function</p> <p><b>Summary.</b></p> <pre> generic ASIND(X)     REAL function ASIND(X)     REAL ::X     DOUBLE PRECISION function     DASIND(X)     DOUBLE PRECISION ::X     QASIND(X)     REAL(16) :: X end </pre>

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
ASINH	<p>Hyperbolic arcsine of radians.</p> <p><b>Class.</b> generic elemental nonstandard function</p> <p><b>Summary.</b></p> <pre>generic ASINH(X)     REAL function ASINH(X)         REAL ::X     DOUBLE PRECISION function DASINH(X)         DOUBLE PRECISION ::X     REAL(16) function QASINH(X)         REAL(16) :: X end</pre>
ASSOCIATED	<p>Return association status of pointer or indicate if pointer is associated with a target.</p> <p><b>Class.</b> generic inquiry function</p> <p><b>Summary.</b></p> <pre>generic ASSOCIATED(POINTER,TARGET)     ! POINTER must be a pointer.     ! TARGET is optional.     ! TARGET must be a pointer or target.     ! TARGET may be of any type, including derived type.     LOGICAL function ASSOCIATED(POINTER,TARGET) end</pre>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
ATAN	<p>Arctangent function in radians.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre> generic ATAN(X)     REAL function ATAN(X)         REAL ::X     DOUBLE PRECISION function     DATAN(X)         DOUBLE PRECISION ::X     REAL(16) function QATAN(X)         REAL(16) :: X     end </pre>
ATAN2	<p>Arctangent function in radians.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre> generic ATAN2(Y,X)     REAL function ATAN2(Y,X)         REAL ::Y,X     DOUBLE PRECISION function     DATAN2(Y,X)         DOUBLE PRECISION ::Y,X     REAL(16) function QATAN2(Y,X)         REAL(16) :: Y,X     end </pre>

continued

Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
ATAND	<div>Arctangent function in degrees.</div> <div><b>Class.</b> generic elemental nonstandard function</div> <div><b>Summary.</b></div> <div>generic ATAN2D(X)           REAL function ATAND(X)           REAL ::X           DOUBLE PRECISION function           DATAND(X)           DOUBLE PRECISION ::X           REAL(16) function QATAN2D(X)           REAL(16) :: X            end</div>
ATAN2D	<div>Arctangent function in degrees.</div> <div><b>Class.</b> generic elemental nonstandard function</div> <div><b>Summary.</b></div> <div>generic ATAN2D(Y,X)           REAL function ATAN2D(Y,X)           REAL ::Y,X           DOUBLE PRECISION function           DATAN2D(Y,X)           DOUBLE PRECISION ::Y,X           REAL(16) function QATAN2D(Y,X)           REAL(16) :: Y,X            end</div>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
ATANH	<p>Hyperbolic arctangent.</p> <p><b>Class.</b> generic elemental nonstandard function</p> <p><b>Summary.</b></p> <pre>generic ATANH(X)     REAL function ATANH(X)     REAL ::X     DOUBLE PRECISION function DATANH(X)     DOUBLE PRECISION ::X     REAL(16) function QATANH(X)     REAL(16) :: X end</pre>
BABS	see ABS
BADDRESS	<p>Return the address of the argument.</p> <p><b>Class.</b> generic inquiry nonstandard function</p> <p><b>Summary.</b></p> <pre>INTEGER function BADDRESS(X)     ! X may be of any type, including any derived     type.</pre>
BBCLR	see IBCLR
BBITS	see IBITS
BBSET	see IBSET
BBTEST	see BTEST
BDIM	see DIM
BIAND	see IAND
BIEOR	see IEOR
BIOR	see IOR
BITEST	see BTEST

continued



Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
BIT_SIZE	<p>Return the number of bits in an integer.</p> <p><b>Class.</b> generic inquiry function</p> <p><b>Summary.</b></p> <pre>generic BIT_SIZE(I)     INTEGER(1) function     BIT_SIZE(I)         INTEGER(1) ::I     INTEGER(2) function     BIT_SIZE(I)         INTEGER(2) ::I     INTEGER(4) function     BIT_SIZE(I)         INTEGER(4) ::I     INTEGER(8) function     BIT_SIZE(I)         INTEGER(8) ::I end</pre>
BIXOR	see IXOR
BJTEST	see BTEST
BKTEST	see BTEST
BMOD	see <u>“MOD(A, P)”</u>
BMVBITS	see MVBITS
BNOT	see NOT
BSHFT	see ISHFT
BSHFTC	see BSHFTC
BSIGN	see SIGN

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
BTEST	<p>Bit test of an integer value.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre> generic BTEST(I,POS)     LOGICAL(1) function     BBTEST(I,POS)         INTEGER(1) :: I,POS     LOGICAL(2) function     BITEST(I,POS)         INTEGER(2) :: I,POS     LOGICAL(2) function     HTEST(I,POS)         INTEGER(2) :: I,POS     LOGICAL(4) function     BJTEST(I,POS)         INTEGER(4) :: I,POS     LOGICAL(8) function     BKTEST(I,POS)         INTEGER(8) :: I,POS end </pre>
CABS	see ABS
CCOS	see COS
CDABS	see ABS
CDCOS	see COS
CDEXP	see EXP
CDLOG	see <a href="#">“LOG(X)”</a>
CDSIN	see SIN
CDSQRT	see SQRT

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
CEILING	<p>Return next larger integer.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre>generic CEILING(A)     REAL(4) function CEILING(A)         REAL(4) ::A     DOUBLE PRECISION function     CEILING(A)         DOUBLE PRECISION ::A     REAL(16) function CEILING(A)         REAL(16) ::A end</pre>
CEXP	see EXP
CHAR	<p>Return integer corresponding to character value.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre>generic CHAR(I,KIND)     INTEGER(1) function     CHAR(I,KIND)         INTEGER(1) ::I;     INTEGER,OPTIONAL ::KIND     INTEGER(2) function     CHAR(I,KIND)         INTEGER(2) ::I;     INTEGER,OPTIONAL ::KIND     INTEGER(4) function     CHAR(I,KIND)         INTEGER(4) ::I;     INTEGER,OPTIONAL ::KIND     INTEGER(8) function     CHAR(I,KIND)         INTEGER(8) ::I;     INTEGER,OPTIONAL ::KIND end</pre>

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
CLOG	see <a href="#">“LOG(X)”</a>
CMPLX	<p>Convert to complex type.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre> generic CMPLX(X,Y,KIND)     COMPLEX function     CMPLX(X,Y,KIND)         INTEGER(1) ::X;     INTEGER(1),OPTIONAL ::Y         INTEGER,OPTIONAL ::KIND     COMPLEX function     CMPLX(X,Y,KIND)         INTEGER(2) ::X;     INTEGER(2),OPTIONAL ::Y         INTEGER,OPTIONAL ::KIND     COMPLEX function     CMPLX(X,Y,KIND)         INTEGER(4) ::X;     INTEGER(4),OPTIONAL ::Y         INTEGER,OPTIONAL ::KIND     COMPLEX function     CMPLX(X,Y,KIND)         INTEGER(8) ::X;     INTEGER(8),OPTIONAL ::Y         INTEGER,OPTIONAL ::KIND     COMPLEX function </pre>

continued

Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
CMPLX (continued)	<div>CMPLX(X,Y,KIND)</div> <div>REAL        ::X;</div> <div>REAL,OPTIONAL ::Y</div> <div>INTEGER,OPTIONAL ::KIND</div> <div>COMPLEX function</div> <div>CMPLX(X,Y,KIND)</div> <div>DOUBLE PRECISION ::X;</div> <div>DOUBLE PRECISION,OPTIONAL ::Y</div> <div>INTEGER,OPTIONAL ::KIND</div> <div>COMPLEX function CMPLX(X,KIND)</div> <div>COMPLEX ::X;</div> <div>INTEGER,OPTIONAL ::KIND</div> <div>COMPLEX function CMPLX(X,KIND)</div> <div>DOUBLE COMPLEX ::X;</div> <div>INTEGER,OPTIONAL ::KIND</div> <div>end</div>
CONJG	<div>Conjugate of a complex number.</div> <div><b>Class.</b> generic elemental function</div> <div><b>Summary.</b></div> <div>generic CONJG(Z)</div> <div>COMPLEX function CONJG(Z)</div> <div>COMPLEX ::Z</div> <div>DOUBLE COMPLEX function</div> <div>DCONJG(Z)</div> <div>DOUBLE COMPLEX ::Z</div> <div>COMPLEX(16) function QCONJG(Z)</div> <div>COMPLEX(16) :: Z</div> <div>end</div>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
COS	<p>Cosine function in radians.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre> generic COS(X)     REAL function COS(X)         REAL ::X     DOUBLE PRECISION function DCOS(X)         DOUBLE PRECISION ::X     COMPLEX function CCOS(X)         COMPLEX ::X     DOUBLE COMPLEX function CDCOS(X)         DOUBLE COMPLEX ::X     DOUBLE COMPLEX function ZCOS(X)         DOUBLE COMPLEX ::X     REAL(16) function QCOS(X)         REAL(16) :: X     COMPLEX(16) functon CQCOS(X)         COMPLEX(16) :: X end </pre>
COSD	<p>Cosine function in degrees.</p> <p><b>Class.</b> generic elemental nonstandard function</p> <p><b>Summary.</b></p> <pre> generic COSD(X)     REAL function COSD(X)         REAL ::X     DOUBLE PRECISION function DCOSD(X)         DOUBLE PRECISION ::X end </pre>

continued

Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
COSH	<div>Hyperbolic cosine function.</div> <div><b>Class.</b> generic elemental function</div> <div><b>Summary.</b></div> <div>generic COSH(X)</div> <div>REAL function COSH(X)</div> <div>REAL ::X</div> <div>DOUBLE PRECISION function</div> <div>DCOSH(X)</div> <div>DOUBLE PRECISION ::X</div> <div>REAL(16) function QCOSH(X)</div> <div>REAL(16) :: X</div> <div>end</div>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
COUNT	<p>Count the number of <code>.TRUE.</code> elements of MASK along dimension DIM.</p> <p><b>Class.</b> generic transformational function</p> <p><b>Summary.</b></p> <pre>generic COUNT(MASK,DIM)     !MASK must be array-valued, DIM     must be scalar     INTEGER function     COUNT(MASK,DIM)         LOGICAL(1) :: MASK         INTEGER,OPTIONAL::DIM     INTEGER function     COUNT(MASK,DIM)         LOGICAL(2) :: MASK         INTEGER,OPTIONAL::DIM     INTEGER function     COUNT(MASK,DIM)         LOGICAL(4) :: MASK         INTEGER,OPTIONAL::DIM     INTEGER function     COUNT(MASK,DIM)         LOGICAL(8) :: MASK         INTEGER,OPTIONAL::DIM end</pre>
CPU_TIME	<p>Returns the current processor time taking into account the frequency of the processor where the current process is running. To get elapsed CPU_TIME, call the intrinsic twice, once to get the start time, and again to get a finish time, and then subtract start from finish.</p> <p><b>Class.</b> generic subroutine</p> <p><b>Summary.</b></p> <pre>SUBROUTINE CPU_TIME(TIME)     !TIME must be REAL scalar. Intel     Fortran allows REAL(4), REAL(8),     REAL(16) or DOUBLE-PRECISION</pre>

continued



**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
CSHIFT	<p>Circular shift an array expression.</p> <p><b>Class.</b> generic transformational function</p> <p><b>Summary.</b></p> <pre>generic CSHIFT(ARRAY,SHIFT,DIM)     ! ARRAY must be array-valued,     ! DIM must be scalar     INTEGER(1) function     CSHIFT(ARRAY,SHIFT,DIM)         INTEGER(1) ::ARRAY;     INTEGER :: SHIFT;     INTEGER,OPTIONAL ::DIM     INTEGER(2) function     CSHIFT(ARRAY,SHIFT,DIM)         INTEGER(2) ::ARRAY;     INTEGER :: SHIFT;     INTEGER,OPTIONAL ::DIM     INTEGER(4) function     CSHIFT(ARRAY,SHIFT,DIM)         INTEGER(4) ::ARRAY;     INTEGER :: SHIFT;     INTEGER,OPTIONAL ::DIM     INTEGER(8) function     CSHIFT(ARRAY,SHIFT,DIM)         INTEGER(8) ::ARRAY;     INTEGER :: SHIFT;     INTEGER,OPTIONAL ::DIM     REAL function     CSHIFT(ARRAY,SHIFT,DIM)         REAL(4) ::ARRAY;     INTEGER :: SHIFT;     INTEGER,OPTIONAL ::DIM</pre>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
CSHIFT (continued)	DOUBLE PRECISION function CSHIFT(ARRAY,SHIFT,DIM) DOUBLE PRECISION ::ARRAY; INTEGER :: SHIFT; INTEGER,OPTIONAL ::DIM LOGICAL(1) function CSHIFT(ARRAY,SHIFT,DIM) REAL(16) ::ARRAY; INTEGER :: SHIFT; INTEGER,OPTIONAL ::DIM LOGICAL(1) ::ARRAY; INTEGER :: SHIFT; INTEGER,OPTIONAL ::DIM LOGICAL(2) function CSHIFT(ARRAY,SHIFT,DIM) LOGICAL(2) ::ARRAY; INTEGER :: SHIFT; INTEGER,OPTIONAL ::DIM LOGICAL(4) function CSHIFT(ARRAY,SHIFT,DIM) LOGICAL(4) ::ARRAY; INTEGER :: SHIFT; INTEGER,OPTIONAL ::DIM LOGICAL(8) function CSHIFT(ARRAY,SHIFT,DIM) LOGICAL(8) ::ARRAY; INTEGER :: SHIFT; INTEGER,OPTIONAL ::DIM COMPLEX function CSHIFT(ARRAY,SHIFT,DIM) COMPLEX ::ARRAY; INTEGER :: SHIFT; INTEGER,OPTIONAL ::DIM

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
CSHIFT (continued)	<div>DOUBLE COMPLEX function</div> <div>CSHIFT(ARRAY,SHIFT,DIM)</div> <div>DOUBLE COMPLEX ::ARRAY; INTEGER</div> <div>:: SHIFT; INTEGER,OPTIONAL ::DIM</div> <div>COMPLEX(16) function</div> <div>CSHIFT(ARRAY,SHIFT,DIM)</div> <div>COMPLEX(16) ::ARRAY; INTEGER</div> <div>:: SHIFT; INTEGER,OPTIONAL ::DIM</div> <div>CHARACTER function</div> <div>CSHIFT(ARRAY,SHIFT,DIM)</div> <div>CHARACTER ::ARRAY; INTEGER ::</div> <div>SHIFT; INTEGER,OPTIONAL ::DIM</div> <div>DERIVED_TYPE function</div> <div>CSHIFT(ARRAY,SHIFT,DIM)</div> <div>DERIVED_TYPE ::ARRAY; INTEGER</div> <div>:: SHIFT; INTEGER,OPTIONAL ::DIM</div> <div>end</div>
CSIN	see SIN
CSQRT	see SQRT
CTAN	see TAN
DABS	see ABS
DACOS	see ACOS
DACOSD	see ACOSD
DACOSH	see ACOSH
DASIN	see ASIN
DASIND	see ASIND
DASINH	see ASINH
DATAN	see ATAN

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
DATAN2	see ATAN2
DATAN2D	see ATAN2D
DATAND	see ATAND
DATANH	see ATANH
DATE_AND_TIME	<p>Return current system date and time.</p> <p><b>Class.</b> generic subroutine</p> <p><b>Summary.</b></p> <p>subroutine</p> <p>DATE_AND_TIME (DATE, TIME, ZONE, VALUES)</p> <p>CHARACTER, OPTIONAL :: DATE</p> <p>CHARACTER, OPTIONAL :: TIME</p> <p>CHARACTER, OPTIONAL :: ZONE</p> <p>CHARACTER, OPTIONAL :: VALUES</p>

continued

Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
DBLE	<div>Convert to double precision type.</div> <div><b>Class.</b> generic elemental function</div> <div><b>Summary.</b></div> <div>generic DBLE(A)</div> <div>DOUBLE PRECISION function</div> <div>DBLE(A)</div> <div>INTEGER(1) ::A</div> <div>DOUBLE PRECISION function</div> <div>DBLE(A)</div> <div>INTEGER(2) ::A</div> <div>DOUBLE PRECISION function</div> <div>DBLE(A)</div> <div>INTEGER(4) ::A</div> <div>DOUBLE PRECISION function</div> <div>DBLE(A)</div> <div>INTEGER(8) ::A</div> <div>DOUBLE PRECISION function</div> <div>DBLE(A)</div> <div>REAL ::A</div> <div>DOUBLE PRECISION function</div> <div>DBLE(A)</div> <div>DOUBLE PRECISION ::A</div> <div>DOUBLE PRECISION function</div> <div>DBLE(A)</div> <div>REAL(16) ::A</div> <div>DOUBLE PRECISION function</div> <div>DBLE(A)</div> <div>COMPLEX ::A</div> <div>DOUBLE PRECISION function</div> <div>DBLE(A)</div> <div>DOUBLE COMPLEX ::A</div>

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
DBLE (continued)	<div>DOUBLE PRECISION function</div> <div>DBLE(A)</div> <div>COMPLEX(16) ::A</div> <div>end</div>
DBLEQ	see DBLE

continued

Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
DCMPLX	<div>Convert to double precision complex type.</div> <div><b>Class.</b> generic elemental nonstandard function</div> <div><b>Summary.</b></div> <div>generic DCMPLX(X,Y)</div> <div>        COMPLEX(8) function</div> <div>DCMPLX(X,Y)</div> <div>        INTEGER(1) ::X;</div> <div>INTEGER(1),OPTIONAL ::Y</div> <div>        COMPLEX(8) function</div> <div>DCMPLX(X,Y)</div> <div>        INTEGER(2) ::X;</div> <div>INTEGER(2),OPTIONAL ::Y</div> <div>        COMPLEX(8) function</div> <div>DCMPLX(X,Y)</div> <div>        INTEGER(4) ::X;</div> <div>INTEGER(4),OPTIONAL ::Y</div> <div>        COMPLEX(8) function</div> <div>DCMPLX(X,Y)</div> <div>        INTEGER(8) ::X;</div> <div>INTEGER(8),OPTIONAL ::Y</div> <div>COMPLEX(8) function DCMPLX(X,Y)</div> <div>        REAL(4) ::X;</div> <div>REAL(4),OPTIONAL ::Y</div> <div>        COMPLEX(8) function</div> <div>DCMPLX(X,Y)</div> <div>        DOUBLE PRECISION ::X;</div> <div>DOUBLE PRECISION,OPTIONAL ::Y</div> <div>        DOUBLE COMPLEX function</div> <div>DCMPLX(X,Y)</div> <div>        REAL(16) ::X;</div> <div>REAL(16),OPTIONAL ::Y</div>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
DCMPLX (continued)	<pre> COMPLEX(8) function DCMPLX(X)     COMPLEX(4) ::X     COMPLEX(8) function DCMPLX(X)         COMPLEX(8) ::X     end </pre>
DCONJG	see CONJG
DCOS	see COS
DCOSD	see COSD
DCOSH	see COSH
DDIM	see DIM
DDINT	see AINT
DEXP	see EXP
DFLOAT	<p>Convert to double precision type.</p> <p><b>Class.</b> generic elemental nonstandard function</p> <p><b>Summary.</b></p> <pre> generic DFLOAT(A)     DOUBLE PRECISION function     DFLOAT(A)         INTEGER(1) ::A     DOUBLE PRECISION function     DFLOTI(A)         INTEGER(2) ::A     DOUBLE PRECISION function     DFLOTJ(A)         INTEGER(4) ::A     DOUBLE PRECISION function     DFLOTK(A)         INTEGER(8) ::A     end </pre>
DFLOTI	see DFLOAT

continued



**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
<a href="#">DFLOATJ</a>	<a href="#">see DFLOAT</a>
<a href="#">DFLOATK</a>	<a href="#">see DFLOAT</a>
DIGITS	<p>Return number of significant digits in the model.</p> <p><b>Class.</b> generic inquiry function</p> <p><b>Summary.</b></p> <pre>generic DIGITS(X)     INTEGER function DIGITS(X)         INTEGER(1) ::X     INTEGER function DIGITS(X)         INTEGER(2) ::X     INTEGER function DIGITS(X)         INTEGER(4) ::X     INTEGER function DIGITS(X)         INTEGER(8) ::X     INTEGER function DIGITS(X)         REAL ::X     INTEGER function DIGITS(X)         DOUBLE PRECISION ::X end</pre>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
DIM	<p>Positive difference.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre> generic DIM(X,Y)     INTEGER(1) function BDIM(X,Y)         INTEGER(1) ::X,Y     INTEGER(2) function HDIM(X,Y)         INTEGER(2) ::X,Y     INTEGER(4) function IDIM(X,Y)         INTEGER(4) ::X,Y     INTEGER(8) function KDIM(X,Y)         INTEGER(8) ::X,Y     REAL function DIM(X,Y)         REAL ::X,Y     DOUBLE PRECISION function     DIM(X,Y)         DOUBLE PRECISION ::X,Y     end </pre>
DIMAG	see IMAG
DINT	see AINT
DLOG	see <a href="#">“LOG(X)”</a>
DLOG10	see <a href="#">“LOG10(X)”</a>
DMAX1	see <a href="#">“MAX(A1, A2, A3, ...)”</a>
DMIN1	see <a href="#">“MIN(A1, A2, A3, ...)”</a>
DMOD	see <a href="#">“MOD(A, P)”</a>
DNINT	see ANINT

continued

Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
DNUM	<p>Convert to double precision.</p> <p><b>Class.</b> specific elemental nonstandard function</p> <p><b>Summary.</b></p> <p>DOUBLE PRECISION function DNUM(I) CHARACTER ::I</p>
DOT_PRODUCT	<p>Dot product multiplication of numeric or logical vectors.</p> <p><b>Class.</b> generic transformational function</p> <p><b>Summary.</b></p> <p>generic DOT_PRODUCT(VECTOR_A,VECTOR_B)</p> <p>Notes.</p> <p>VECTOR_A must be of numeric type (integer, real, complex) or of logical type. It must be array-valued and of rank one.</p> <p>VECTOR_B must be of numeric type if VECTOR_A is of numeric type or of logical type if VECTOR_A is of type logical. It must have the same shape as VECTOR_A.</p> <p>If the arguments are of numeric type:</p> <p>If VECTOR_A is of type integer or real, the result has value SUM(VECTOR_A*VECTOR_B).</p> <p>If VECTOR_A is of type complex, the result has value CONJG(VECTOR_A)*VECTOR_B.</p> <p>If the arguments are of logical type the result has value ANY(VECTOR_A .AND. VECTOR_B).</p>
DPROD	<p>Double precision real product.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <p>generic DPROD(X,Y)</p> <p>DOUBLE PRECISION function DPROD(X,Y) REAL ::X,Y end</p>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
<code>DREAL</code>	<p>Convert to double precision.</p> <p><b>Class.</b> generic elemental nonstandard function</p> <p><b>Summary.</b></p> <pre> generic DREAL(A)     DOUBLE PRECISION function     DREAL(A)         INTEGER(1) ::A     DOUBLE PRECISION function     DREAL(A)         INTEGER(2) ::A     DOUBLE PRECISION function     DREAL(A)         INTEGER(4) ::A     DOUBLE PRECISION function     DREAL(A)         INTEGER(8) ::A     DOUBLE PRECISION function     DREAL(A)         REAL ::A     DOUBLE PRECISION function     DREAL(A)         DOUBLE PRECISION ::A     DOUBLE PRECISION function     DREAL(A)         REAL(16):: A     DOUBLE PRECISION function     DREAL(A)         COMPLEX ::A     DOUBLE PRECISION function     DREAL(A)         DOUBLE COMPLEX ::A     DOUBLE PRECISION function     DREAL(A)         COMPLEX(16) :: A end </pre>

continued

Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
DSIGN	see SIGN
DSIN	see SIN
DSIND	see SIND
DSINH	see SINH
DSQRT	see SQRT
DTAN	see TAN
DTAND	see TAND
DTANH	see TANH
EOSHIFT	End off shift on an array expression. <b>Class.</b> generic transformational function <b>Summary.</b> generic EOSHIFT(ARRAY,SHIFT,BOUNDARY,DIM) ! ARRAY must be array-valued ! SHIFT must be of type integer--see Notes below ! DIM must be a scalar integer ! BOUNDARY and DIM are optional INTEGER(1) function EOSHIFT(ARRAY,SHIFT,BOUNDARY,DIM) INTEGER(1) ::ARRAY, BOUNDARY INTEGER(2) function EOSHIFT(ARRAY,SHIFT,BOUNDARY,DIM) INTEGER(2) ::ARRAY, BOUNDARY INTEGER(4) function EOSHIFT(ARRAY,SHIFT,BOUNDARY,DIM) INTEGER(4) ::ARRAY, BOUNDARY INTEGER(8) function EOSHIFT(ARRAY,SHIFT,BOUNDARY,DIM) INTEGER(8) ::ARRAY, BOUNDARY

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
EOSHIFT (continued)	<p>REAL function</p> <p>EOSHIFT(ARRAY,SHIFT,BOUNDARY,DIM)</p> <p>REAL ::ARRAY, BOUNDARY</p> <p>DOUBLE PRECISION function</p> <p>EOSHIFT(ARRAY,SHIFT,BOUNDARY,DIM)</p> <p>DOUBLE PRECISION ::ARRAY,</p> <p>BOUNDARY</p> <p>LOGICAL(1) function</p> <p>EOSHIFT(ARRAY,SHIFT,BOUNDARY,DIM)</p> <p>LOGICAL(1) ::ARRAY,</p> <p>BOUNDARY</p> <p>LOGICAL(2) function</p> <p>EOSHIFT(ARRAY,SHIFT,BOUNDARY,DIM)</p> <p>LOGICAL(2) ::ARRAY,</p> <p>BOUNDARY</p> <p>LOGICAL(4) function</p> <p>EOSHIFT(ARRAY,SHIFT,BOUNDARY,DIM)</p> <p>LOGICAL(4) ::ARRAY,</p> <p>BOUNDARY</p> <p>LOGICAL(8) function</p> <p>EOSHIFT(ARRAY,SHIFT,BOUNDARY,DIM)</p>

continued

Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
EOSHIFT (continued)	<div>LOGICAL(8) ::ARRAY, BOUNDARY COMPLEX function EOSHIFT(ARRAY,SHIFT,BOUNDARY,DIM) COMPLEX ::ARRAY, BOUNDARY DOUBLE COMPLEX function EOSHIFT(ARRAY,SHIFT,BOUNDARY,DIM) DOUBLE COMPLEX ::ARRAY, BOUNDARY CHARACTER function EOSHIFT(ARRAY,SHIFT,BOUNDARY,DIM) CHARACTER ::ARRAY, BOUNDARY DERIVED TYPE function EOSHIFT(ARRAY,SHIFT,BOUNDARY,DIM) <i>DERIVED_TYPE</i> ::ARRAY, BOUNDARY end</div> <div><b>Notes.</b> SHIFT must be of type integer and must be scalar if ARRAY has rank one; otherwise see the section <a href="#">“EOSHIFT(ARRAY, SHIFT, BOUNDARY, DIM)” on page 192.</a></div>
EPSILON	<div>Return positive number that is almost negligible compared to unity in the real number model. <b>Class.</b> generic inquiry function <b>Summary.</b> generic EPSILON(X) REAL function EPSILON(X) REAL ::X DOUBLE PRECISION function EPSILON(X) DOUBLE PRECISION ::X end</div> <div>continued</div>

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
EXP	<p>Exponential.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre> generic EXP(X)     REAL function EXP(X)         REAL ::X     DOUBLE PRECISION function DEXP(X)     DOUBLE PRECISION ::X     COMPLEX function CEXP(X)         COMPLEX ::X     DOUBLE COMPLEX function CDEXP(X)         DOUBLE COMPLEX ::X     DOUBLE COMPLEX function ZEXP(X)         DOUBLE COMPLEX ::X end </pre>
EXPONENT	<p>Return the exponent part of the argument when represented as a model number.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre> generic EXPONENT(X)     INTEGER function EXPONENT(X)         REAL ::X     INTEGER function EXPONENT(X)         DOUBLE PRECISION ::X end </pre>
FLOAT	see REAL
FLOATI	see REAL
FLOATJ	see REAL

continued



Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
<a href="#">FLOATK</a>	<a href="#">see REAL</a>
FLOOR	<p>Return the greatest integer less than or equal to the argument.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre>generic FLOOR(A)     REAL function FLOOR(A)         REAL ::A     DOUBLE PRECISION function FLOOR(A)     DOUBLE PRECISION ::A     <a href="#">REAL(16) function FLOOR(A)</a>         <a href="#">REAL(16)::A</a> end</pre>
FRACTION	<p>Return the fractional part of the model representation of the argument value.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre>generic FRACTION(X)     REAL function FRACTION(X)         REAL ::X     DOUBLE PRECISION function FRACTION(X)     DOUBLE PRECISION ::X     <a href="#">REAL(16) function FRACTION(X)</a>         <a href="#">REAL(16) X</a> end</pre>
<a href="#">FREE (A)</a>	<p><a href="#">Frees memory that is currently allocated.</a></p> <p><b>Class.</b> <a href="#">Elemental nonstandard subroutine.</a></p>
HABS	<a href="#">see ABS</a>
<a href="#">HBCLR</a>	<a href="#">see IBCLR</a>
<a href="#">HBITS</a>	<a href="#">see IBITS</a>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
HBSET	see IBSET
HDIM	see DIM
HFIX	<p>Convert to <code>INTEGER(2)</code> type.</p> <p><b>Class.</b> generic elemental nonstandard function</p> <p><b>Summary.</b></p> <pre> generic HFIX(A)     INTEGER(2) function HFIX(A)         INTEGER(1) ::A     INTEGER(2) function HFIX(A)         INTEGER(2) ::A     INTEGER(2) function HFIX(A)         INTEGER(4) ::A     INTEGER(2) function HFIX(A)         INTEGER(8) ::A     INTEGER(2) function IIDINT(A)         DOUBLE PRECISION ::A     INTEGER(2) function HFIX(A)         COMPLEX ::A     INTEGER(2) function HFIX(A)         DOUBLE COMPLEX ::A end </pre>
HIAND	see IAND
HIEOR	see IEOR
HIOR	see IOR
HIXOR	see IXOR
HMOD	see <u><a href="#">“MOD(A, P)”</a></u>
HMVBITS	see MVBITS
HNOT	see NOT
HSHFT	see ISHFT
HSHFTC	see ISHFTC

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
<a href="#">HSIGN</a>	<a href="#">see SIGN</a>
<a href="#">HTEST</a>	<a href="#">see BTEST</a>
HUGE	<p>Return the largest number in the model representing numbers.</p> <p><b>Class.</b> generic inquiry function</p> <p><b>Summary.</b></p> <pre>generic HUGE(X)     INTEGER(1) function HUGE(X)         INTEGER(1) ::X     INTEGER(2) function HUGE(X)         INTEGER(2) ::X     INTEGER(4) function HUGE(X)         INTEGER(4) ::X     INTEGER(8) function HUGE(X)         INTEGER(8) ::X     REAL function HUGE(X)         REAL ::X     DOUBLE PRECISION function     HUGE(X)         DOUBLE PRECISION ::X     <a href="#">REAL(16) function HUGE(X)</a>         <a href="#">REAL(16) HUGE</a> end</pre>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
IABS	<p>Integer absolute value.</p> <p><b>Class.</b> specific elemental function</p> <p><b>Summary.</b></p> <pre> generic IABS(A)     INTEGER(1) function IABS(A)         INTEGER(1) ::A     INTEGER(2) function IIABS(A)         INTEGER(2) ::A     INTEGER(4) function JIABS(A)         INTEGER(4) ::A     INTEGER(8) function KIABS(A)         INTEGER(8) ::A end </pre>
IACHAR	<p>Return the position of a character in the ASCII sequence</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre> generic IACHAR(C)     INTEGER function IACHAR(C)         CHARACTER ::C end </pre>

continued

Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
IADDR	<div>Return the address of the argument.</div> <div><b>Class.</b> specific inquiry nonstandard function</div> <div><b>Summary.</b></div> <div>INTEGER function IADDR(X)</div> <div>! X may be any one of the following:</div> <div>INTEGER(1) ::X</div> <div>INTEGER(2) ::X</div> <div>INTEGER(4) ::X</div> <div>INTEGER(8) ::X</div> <div>REAL ::X</div> <div>DOUBLE PRECISION ::X</div> <div>COMPLEX ::X</div> <div>DOUBLE COMPLEX ::X</div> <div>LOGICAL(1) ::X</div> <div>LOGICAL(2) ::X</div> <div>LOGICAL(4) ::X</div> <div>LOGICAL(8) ::X</div> <div>CHARACTER ::X</div> <div>DERIVED_TYPE :: X</div>

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
IAND	<p>Bitwise logical AND.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre> generic IAND(I,J)     INTEGER(1) function BIAND(I,J)         INTEGER(1) ::I,J     INTEGER(2) function HIAND(I,J)         INTEGER(2) ::I,J     INTEGER(2) function IIAND(I,J)         INTEGER(2) ::I,J     INTEGER(4) function JIAND(I,J)         INTEGER(4) ::I,J     INTEGER(8) function KIAND(I,J)         INTEGER(8) ::I,J end </pre>

continued

Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
IBCLR	<div>Clear a bit to zero.</div> <div><b>Class.</b> generic elemental function</div> <div><b>Summary.</b></div> <div><pre>generic IBCLR(I,POS)     INTEGER(1) function     BBCLR(I,POS)         INTEGER(1) :: I,POS     INTEGER(2) function     HBCLR(I,POS)         INTEGER(2) :: I,POS     INTEGER(2) function     IIBCLR(I,POS)         INTEGER(2) :: I,POS     INTEGER(4) function     JIBCLR(I,POS)         INTEGER(4) :: I,POS     INTEGER(8) function     KIBCLR(I,POS)         INTEGER(8) :: I,POS end</pre></div>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
IBITS	<p>Extract a sequence of bits.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre> generic IBITS(I,POS,LEN)     INTEGER(1) function     BBITS(I,POS,LEN)         INTEGER(1) :: I,POS,LEN     INTEGER(2) function     HBITS(I,POS,LEN)         INTEGER(2) :: I,POS,LEN     INTEGER(2) function     IIBITS(I,POS,LEN)         INTEGER(2) :: I,POS,LEN     INTEGER(4) function     JIBITS(I,POS,LEN)         INTEGER(4) :: I,POS,LEN     INTEGER(8) function     KIBITS(I,POS,LEN)         INTEGER(8) :: I,POS,LEN end </pre>

continued



**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
IBSET	<p>Set a bit to one.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre>generic IBSET(I,POS)     INTEGER(1) function     BBSET(I,POS)         INTEGER(1) :: I,POS     INTEGER(2) function     HBSET(I,POS)         INTEGER(2) :: I,POS     INTEGER(2) function     IIBSET(I,POS)         INTEGER(2) :: I,POS     INTEGER(4) function     JIBSET(I,POS)         INTEGER(4) :: I,POS     INTEGER(8) function     KIBSET(I,POS)         INTEGER(8) :: I,POS end</pre>
ICHAR	<p>Return ASCII value corresponding to character.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre>generic ICHAR(C)     INTEGER function ICHAR(C)         CHARACTER :: C end</pre>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
IDIM	<p>Integer positive difference.</p> <p><b>Class.</b> specific elemental nonstandard function</p> <p><b>Summary.</b></p> <pre>generic function DIM(X,Y)     INTEGER(1) function BDIM(X,Y)         INTEGER(1) ::X,Y     INTEGER(2) function IIDIM(X,Y)         INTEGER(2) ::X,Y     INTEGER(4) function JIDIM(X,Y)         INTEGER(4) ::X,Y     INTEGER(8) function KIDIM(X,Y)         INTEGER(8) ::X,Y end</pre>
IDINT	see INT8
IDNINT	see NINT
IEOR	<p>Bitwise exclusive OR.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre>generic IEOE(I,J)     INTEGER(1) function BIEOE(I,J)         INTEGER(1) ::I,J     INTEGER(2) function HIEOE(I,J)         INTEGER(2) ::I,J     INTEGER(2) function IIEOE(I,J)         INTEGER(2) ::I,J     INTEGER(4) function JIEOE(I,J)         INTEGER(4) ::I,J     INTEGER(8) function KIEOE(I,J)         INTEGER(8) ::I,J end</pre>

continued

Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
IFIX	see INT
IIABS	see IABS
IIAND	see IAND
IIBCLR	see IBCLR
IIBITS	see IBITS
IIBSET	see IBSET
IIDIM	see IDIM
IIDINT	see IDINT
IIDNNT	see NINT
IIEOR	see IEOR
IIFIX	see INT
IINT	see INT
IIOR	see IOR
IIQINT	see IQINT
IIQNNT	see NINT
IISHFT	see ISHFT
IISHFTC	see ISHFTC
IISIGN	see SIGN
IIXOR	see IXOR
IJINT	Convert to INTEGER ( 2 ). <b>Class.</b> specific elemental nonstandard function <b>Summary.</b> INTEGER(2) function IJINT(A) INTEGER(4) ::A

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
IMAG	<p>Imaginary part of a complex number.</p> <p><b>Class.</b> generic elemental nonstandard function</p> <p><b>Summary.</b></p> <pre>generic IMAG(Z)     REAL function IMAG(Z)         COMPLEX ::Z     DOUBLE PRECISION function     DIMAG(Z)         DOUBLE COMPLEX ::Z     end</pre>
IMAX0	see <a href="#">“MAX(A1, A2, A3, ...)”</a>
IMAX1	see <a href="#">“MAX(A1, A2, A3, ...)”</a>
IMIN0	see <a href="#">“MIN(A1, A2, A3, ...)”</a>
IMIN1	see <a href="#">“MIN(A1, A2, A3, ...)”</a>
IMOD	see <a href="#">“MOD(A, P)”</a>
INDEX	<p>Return the starting position of a substring within a string.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre>generic INDEX(STRING, SUBSTRING, BACK)     INTEGER function     INDEX(STRING, SUBSTRING, BACK)         CHARACTER::STRING         CHARACTER::SUBSTRING         LOGICAL, OPTIONAL::BACK     end</pre>
ININT	see NINT
INOT	see NOT

continued

Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
INT	<div>Convert to integer type.</div> <div><b>Class.</b> generic elemental function</div> <div><b>Summary.</b></div> <div>generic INT(A,KIND)</div> <div>INTEGER(2) function IINT(A)</div> <div>REAL ::A</div> <div>INTEGER function INT(A, KIND)</div> <div>INTEGER(1) ::A;</div> <div>INTEGER,OPTIONAL ::KIND</div> <div>INTEGER function INT(A, KIND)</div> <div>INTEGER(2) ::A</div> <div>INTEGER,OPTIONAL ::KIND</div> <div>INTEGER(4) function IFIX(A)</div> <div>REAL ::A</div> <div>INTEGER(8) function KIFIX(A)</div> <div>REAL ::A</div> <div>INTEGER(8) function KINT(A</div> <div>REAL ::A</div> <div>INTEGER(4) function JIFIX(A)</div> <div>REAL ::A</div> <div>INTEGER(4) function JINT(A)</div> <div>REAL ::A</div> <div>INTEGER(4) function IDINT(A)</div> <div>DOUBLE PRECISION ::A</div> <div>INTEGER(4) function JIDINT(A)</div> <div>DOUBLE PRECISION ::A</div> <div>INTEGER(2) function IIQINT(A)</div> <div>REAL(16) :: A</div> <div>INTEGER function INT(A, KIND)</div> <div>COMPLEX ::A</div>

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
INT (continued)	<div> <div> <div>INTEGER,OPTIONAL ::KIND</div> <div>INTEGER function INT(A, KIND)</div> <div>DOUBLE COMPLEX ::A</div> <div>INTEGER,OPTIONAL ::KIND</div> <div>INTEGER function INT(A,KIND)</div> <div>COMPLEX(16) :: A</div> <div>INTEGER,OPTIONAL ::KIND</div> <div>end</div> </div> </div>

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
INT1	<div>Convert to INTEGER(1) type.</div> <div><b>Class.</b> generic elemental nonstandard function</div> <div><b>Summary.</b></div> <div>generic INT1(A)</div> <div>INTEGER(1) function INT1(A)</div> <div>INTEGER(1) ::A</div> <div>INTEGER(1) function INT1(A)</div> <div>INTEGER(2) ::A</div> <div>INTEGER(1) function INT1(A)</div> <div>INTEGER(4) ::A</div> <div>INTEGER(1) function INT1(A)</div> <div>INTEGER(8) ::A</div> <div>INTEGER(1) function INT1(A)</div> <div>REAL ::A</div> <div>INTEGER(1) function INT1(A)</div> <div>DOUBLE PRECISION ::A</div> <div>INTEGER(1) function INT1(A)</div> <div>REAL(16) :: A</div> <div>INTEGER(1) function INT1(A)</div> <div>COMPLEX ::A</div> <div>INTEGER(1) function INT1(A)</div> <div>DOUBLE COMPLEX ::A</div> <div>INTEGER(1) function INT1(A)</div> <div>COMPLEX(16) :: A</div> <div>INTEGER(1) function INT1(A)</div> <div>LOGICAL(1) ::A</div> <div>INTEGER(1) function INT1(A)</div> <div>LOGICAL(2) ::A</div> <div>INTEGER(1) function INT1(A)</div> <div>LOGICAL(4) ::A</div> <div>INTEGER(1) function INT1(A)</div> <div>LOGICAL(8) ::A</div> <div>end</div>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
INT2	<p>Convert to <code>INTEGER(2)</code> type.</p> <p><b>Class.</b> generic elemental nonstandard function</p> <p><b>Summary.</b></p> <pre> generic INT2(A)     INTEGER(2) function INT2(A)         INTEGER(1) ::A     INTEGER(2) function INT2(A)         INTEGER(2) ::A     INTEGER(2) function INT2(A)         INTEGER(4) ::A     INTEGER(2) function INT2(A)         INTEGER(8) ::A     INTEGER(2) function INT2(A)         REAL ::A     INTEGER(2) function INT2(A)         DOUBLE PRECISION ::A     INTEGER(2) function INT2(A)         COMPLEX ::A     INTEGER(2) function INT2(A)         DOUBLE COMPLEX ::A     INTEGER(2) function INT2(A)         LOGICAL(1) ::A     INTEGER(2) function INT2(A)         LOGICAL(2) ::A     INTEGER(2) function INT2(A)         LOGICAL(4) ::A     INTEGER(2) function INT2(A)         LOGICAL(8) ::A end </pre>

continued



**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
INT4	<div>Convert to INTEGER( 4 ) type.</div> <div><b>Class.</b> generic elemental nonstandard function</div> <div><b>Summary.</b></div> <div>generic INT4(A)     INTEGER(4) function INT4(A)         INTEGER(1) ::A     INTEGER(4) function INT4(A)         INTEGER(2) ::A     INTEGER(4) function INT4(A)         INTEGER(4) ::A     INTEGER(4) function INT4(A)         INTEGER(8) ::A     INTEGER(4) function INT4(A)         REAL ::A     INTEGER(4) function INT4(A)         DOUBLE PRECISION ::A     INTEGER(4) function INT4(A)         REAL(16) :: A     INTEGER(4) function INT4(A)         COMPLEX ::A     INTEGER(4) function INT4(A)         DOUBLE COMPLEX ::A     INTEGER(4) function INT4(A)         COMPLEX(16) :: A  end</div>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
INT8	<p>Convert to INTEGER( 8 ) type.</p> <p><b>Class.</b> generic elemental nonstandard function</p> <p><b>Summary.</b></p> <pre> generic INT8(A)     INTEGER(8) function INT8(A)         INTEGER(1) ::A     INTEGER(8) function INT8(A)         INTEGER(2) ::A     INTEGER(8) function INT8(A)         INTEGER(4) ::A     INTEGER(8) function INT8(A)         INTEGER(8) ::A     INTEGER(8) function INT8(A)         REAL ::A     INTEGER(8) function INT8(A)         DOUBLE PRECISION ::A     INTEGER(8) function INT8(A)         REAL(16) ::A     INTEGER(8) function INT8(A)         COMPLEX ::A     INTEGER(8) function INT8(A)         DOUBLE COMPLEX ::A     INTEGER(8) function KIDINT(A)         DOUBLE PRECISION ::A     INTEGER(8) function INT8(A)         COMPLEX(16) :: A     INTEGER(8) function KIDINT(A)         DOUBLE PRECISION ::A end </pre>

continued

Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
INUM	<p>Convert character to INTEGER(2) type.</p> <p><b>Class.</b> specific elemental nonstandard function</p> <p><b>Summary.</b></p> <p>INTEGER(2) function INUM(I)</p> <p>CHARACTER ::I</p> <p>NOTE: The ASCII characters in the CHARACTER expression must be numeric characters, and the result must fit in an INTEGER(2) number.</p>
IOR	<p>Logical OR.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <p>generic IOR(I,J)</p> <p>INTEGER(1) function BIOR(I,J)</p> <p>INTEGER(1) ::I,J</p> <p>INTEGER(2) function HIOR(I,J)</p> <p>INTEGER(2) ::I,J</p> <p>INTEGER(2) function IIOR(I,J)</p> <p>INTEGER(2) ::I,J</p> <p>INTEGER(4) function JIOR(I,J)</p> <p>INTEGER(4) ::I,J</p> <p>INTEGER(8) function KIOR(I,J)</p> <p>INTEGER(8) ::I,J</p> <p>end</p>
IQNINT	see NINT

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
ISHFT	<p>Logical shift.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre> generic ISHFT(I,SHIFT)     INTEGER(1) function     BSHFT(I,SHIFT)         INTEGER(1) ::I,SHIFT     INTEGER(2) function     HSHFT(I,SHIFT)         INTEGER(2) ::I,SHIFT     INTEGER(2) function     IISHFT(I,SHIFT)         INTEGER(2) ::I,SHIFT     INTEGER(4) function     JISHFT(I,SHIFT)         INTEGER(4) ::I,SHIFT     INTEGER(8) function     KISHFT(I,SHIFT)         INTEGER(8) ::I,SHIFT end </pre>

continued

Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
ISHFTC	<p>Circular shift of the rightmost bits.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre>generic ISHFTC(I,SHIFT,SIZE)     INTEGER(1) function     BSHFTC(I,SHIFT,SIZE)         INTEGER(1) ::I,SHIFT         INTEGER(1),OPTIONAL :: SIZE     INTEGER(2) function     HSHFTC(I,SHIFT,SIZE)         INTEGER(2) ::I,SHIFT         INTEGER(2),OPTIONAL :: SIZE     INTEGER(2) function     IISHFTC(I,SHIFT,SIZE)         INTEGER(2) ::I,SHIFT         INTEGER(2),OPTIONAL :: SIZE     INTEGER(4) function     JISHFTC(I,SHIFT,SIZE)         INTEGER(4) ::I,SHIFT         INTEGER(4),OPTIONAL :: SIZE     INTEGER(8) function     KISHFTC(I,SHIFT,SIZE)         INTEGER(8) ::I,SHIFT         INTEGER(8),OPTIONAL :: SIZE end</pre>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
ISIGN	<p>Absolute value of A times the sign of B.  See also SIGN.  <b>Class.</b> generic nonstandard function  <b>Summary.</b>  <pre> generic ISIGN(A,B)     INTEGER(1) function BSIGN(A,B)         INTEGER(1) ::A,B     INTEGER(2) function     IISIGN(A,B)         INTEGER(2) ::A,B     INTEGER(4) function     JISIGN(A,B)         INTEGER(4) ::A,B     INTEGER(8) function     KISIGN(A,B)         INTEGER(8) ::A,B     end </pre> </p>
ISNAN	<p>Determine if a value is NaN.  <b>Class.</b> generic elemental nonstandard function  <b>Summary.</b>  <pre> generic ISNAN(X)     LOGICAL function ISNAN(X)         REAL ::X     LOGICAL function ISNAN(X)         DOUBLE PRECISION ::X     LOGICAL function ISNAN(X)     end </pre> </p>

continued

Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
IXOR	Exclusive OR. <b>Class.</b> generic elemental nonstandard function <b>Summary.</b> generic IXOR(I,J) INTEGER(1) function BIXOR(I,J) INTEGER(1) ::I,J INTEGER(2) function HIXOR(I,J) INTEGER(2) ::I,J INTEGER(2) function IIXOR(I,J) INTEGER(2) ::I,J INTEGER(4) function JIXOR(I,J) INTEGER(4) ::I,J INTEGER(8) function IXOR(I,J) INTEGER(8) ::I,J end JIABS           see IABS JIAND           see IAND JIBCLR          see IBCLR JIBITS          see IBITS JIBSET          see IBSET JIDIM           see IDIM JIDINT          see IDINT JIDNNT          see NINT JIEOR           see IEOR JIFIX           see INT JINT            see INT JIOR            see IOR JIQINT          see IQINT JIQNNT          see NINT

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
JISHFT	see ISHFT
JISHFTC	see ISHFTC
JISIGN	see SIGN
JIXOR	see IXOR
JMAX0	see <u>“MAX(A1, A2, A3, ...)”</u>
JMAX1	see <u>“MAX(A1, A2, A3, ...)”</u>
JMIN0	see <u>“MIN(A1, A2, A3, ...)”</u>
JMIN1	see <u>“MIN(A1, A2, A3, ...)”</u>
JMOD	see <u>“MOD(A, P)”</u>
JNINT	see NINT
JNOT	see NOT
JNUM	<p>Convert character to integer type.</p> <p><b>Class.</b> specific elemental nonstandard function</p> <p><b>Summary.</b></p> <p>INTEGER(4) function JNUM(I)  CHARACTER ::I</p> <p>NOTE: The characters in the ASCII CHARACTER expression must be numeric, and the result must fit in an INTEGER(4) number.</p>
KIABS	see IABS
KIAND	see IAND
KIBCLR	see IBCLR
KIBITS	see IBITS
KIBSET	see IBSET
KIDIM	see IDIM
KIDINT	see IDINT
KIDNNT	see NINT
KIEOR	see IEOR
KIFIX	see INT

continued



Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
KIND	<div>Return the kind type parameter of the argument.</div> <div><b>Class.</b> generic inquiry function</div> <div><b>Summary.</b></div> <div>generic KIND(X)</div> <div>INTEGER function KIND(X)</div> <div>INTEGER(1) ::X</div> <div>INTEGER function KIND(X)</div> <div>INTEGER(2) ::X</div> <div>INTEGER function KIND(X)</div> <div>INTEGER(4) ::X</div> <div>INTEGER function KIND(X)</div> <div>INTEGER(8) ::X</div> <div>INTEGER function KIND(X)</div> <div>REAL(4) ::X</div> <div>INTEGER function KIND(X)</div> <div>REAL(8) ::X</div> <div>INTEGER function KIND(X)</div> <div>REAL(16)::X</div> <div>INTEGER function KIND(X)</div> <div>COMPLEX(4) ::X</div> <div>INTEGER function KIND(X)</div> <div>COMPLEX(8) ::X</div> <div>INTEGER function KIND(X)</div> <div>COMPLEX(16)::X</div> <div>INTEGER function KIND(X)</div> <div>LOGICAL(1) ::X</div> <div>INTEGER function KIND(X)</div> <div>LOGICAL(2) ::X</div> <div>INTEGER function KIND(X)</div> <div>LOGICAL(4) ::X</div> <div>INTEGER function KIND(X)</div> <div>LOGICAL(8) ::X</div> <div>end</div>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
KINT	see INT
KIOR	see IOR
KIQINT	see IQINT
KIQNNT	see NINT
KISHFT	see ISHFT
KISHFTC	see ISHFTC
KISIGN	see SIGN
KMAX0	see <a href="#">“MAX(A1, A2, A3, ...)”</a>
KMAX1	see <a href="#">“MAX(A1, A2, A3, ...)”</a>
KMIN0	see <a href="#">“MIN(A1, A2, A3, ...)”</a>
KMIN1	see <a href="#">“MIN(A1, A2, A3, ...)”</a>
KMOD	see <a href="#">“MOD(A, P)”</a>
KNINT	see NINT
KNOT	see NOT

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
LBOUND	<div>Return lower bounds of an array.</div> <div><b>Class.</b> generic inquiry function</div> <div><b>Summary.</b></div> <div>generic LBOUND(ARRAY,DIM)</div> <div>!ARRAY must be array-valued, DIM must be scalar</div> <div><div>INTEGER function</div><div>LBOUND(ARRAY,DIM)</div><div>LOGICAL(1) ::ARRAY;</div><div>INTEGER,OPTIONAL ::DIM</div><div>INTEGER function</div><div>LBOUND(ARRAY,DIM)</div><div>LOGICAL(2) ::ARRAY;</div><div>INTEGER,OPTIONAL ::DIM</div><div>INTEGER function</div><div>LBOUND(ARRAY,DIM)</div><div>LOGICAL(4) ::ARRAY;</div><div>INTEGER,OPTIONAL ::DIM</div><div>INTEGER function</div><div>LBOUND(ARRAY,DIM)</div><div>LOGICAL(8) ::ARRAY;</div><div>INTEGER,OPTIONAL ::DIM</div><div>INTEGER function</div><div>LBOUND(ARRAY,DIM)</div></div>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
LBOUND (continued)	<pre> INTEGER(1) ::ARRAY; INTEGER,OPTIONAL ::DIM     INTEGER function LBOUND(ARRAY,DIM)         INTEGER(2) ::ARRAY; INTEGER,OPTIONAL ::DIM     INTEGER function LBOUND(ARRAY,DIM)         INTEGER(4) ::ARRAY; INTEGER,OPTIONAL ::DIM     INTEGER function LBOUND(ARRAY,DIM)         INTEGER(8) ::ARRAY; INTEGER,OPTIONAL ::DIM     INTEGER function LBOUND(ARRAY,DIM)         REAL(4) ::ARRAY; INTEGER,OPTIONAL ::DIM     INTEGER function LBOUND(ARRAY,DIM)         REAL(8) ::ARRAY; INTEGER,OPTIONAL ::DIM LBOUND(ARRAY,DIM)         REAL(16) ::ARRAY; INTEGER,OPTIONAL ::DIM     INTEGER function LBOUND(ARRAY,DIM)         COMPLEX(4) ::ARRAY; INTEGER,OPTIONAL ::DIM </pre>

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
LBOUND (continued)	<pre>INTEGER function LBOUND (ARRAY, DIM)     COMPLEX(8) ::ARRAY; INTEGER, OPTIONAL ::DIM INTEGER function LBOUND (ARRAY, DIM)     COMPLEX(16) ::ARRAY; INTEGER, OPTIONAL ::DIM     INTEGER function LBOUND (ARRAY, DIM)     CHARACTER ::ARRAY; INTEGER, OPTIONAL ::DIM     INTEGER function LBOUND (ARRAY, DIM)     DERIVED_TYPE ::ARRAY; INTEGER, OPTIONAL ::DIM end</pre>
LEN	<p>Return the length of a character argument.</p> <p><b>Class.</b> generic inquiry function</p> <p><b>Summary.</b></p> <pre>generic LEN (STRING)     INTEGER function LEN (STRING)     CHARACTER ::STRING end</pre>
LEN_TRIM	<p>Length of a character string not including trailing blanks.</p> <p><b>Class.</b> generic inquiry function</p> <p><b>Summary.</b></p> <pre>generic LEN_TRIM (STRING)     INTEGER function LEN_TRIM (STRING)     CHARACTER ::STRING end</pre>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
LGE	<p>Lexical greater than or equal to comparison for strings.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre>generic LGE (STRING_A, STRING_B)     LOGICAL function     LGE (STRING_A, STRING_B)     CHARACTER     :: STRING_A, STRING_B end</pre>
LGT	<p>Lexical greater than comparison for strings.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre>generic LGT (STRING_A, STRING_B)     LOGICAL function     LGT (STRING_A, STRING_B)     CHARACTER     :: STRING_A, STRING_B end</pre>
LLE	<p>Lexical less than or equal to comparison for strings.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre>generic LLE (STRING_A, STRING_B)     LOGICAL function     LLE (STRING_A, STRING_B)     CHARACTER     :: STRING_A, STRING_B end</pre>

continued

Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
LLT	<div>Lexical less than comparison for strings.</div> <div><b>Class.</b> generic elemental function</div> <div><b>Summary.</b></div> <div>generic LLT(STRING_A,STRING_B) LOGICAL function LLT(STRING_A,STRING_B) CHARACTER ::STRING_A,STRING_B end</div>
LOC	<div>Return the address of the argument.</div> <div><b>Class.</b> generic inquiry nonstandard function</div> <div><b>Summary.</b></div> <div>INTEGER function LOC(X) ! X may be any one of the following: INTEGER(1) ::X INTEGER(2) ::X INTEGER(4) ::X INTEGER(8) ::X REAL ::X DOUBLE PRECISION ::X REAL(16)::X COMPLEX ::X DOUBLE COMPLEX ::X COMPLEX(16)::X LOGICAL(1) ::X LOGICAL(2) ::X LOGICAL(4) ::X LOGICAL(8) ::X</div>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
LOC (continued)	<p>CHARACTER ::X</p> <p>DERIVED TYPE ::X</p> <p><i>Note: For Itanium™-based applications, the returned type of the LOC function is INTEGER*8.</i></p>
LOG	<p>Natural logarithm.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre>generic LOG(X)     REAL function ALOG(X)         REAL ::X     DOUBLE PRECISION function DLOG(X)         DOUBLE PRECISION ::X     REAL(16) function QLOG(X)         REAL(16) :: X     COMPLEX function CLOG(X)         COMPLEX ::X     DOUBLE COMPLEX function CDLOG(X)         DOUBLE COMPLEX ::X     DOUBLE COMPLEX function ZLOG(X)         DOUBLE COMPLEX ::X     COMPLEX(16) CQLOG(X)         COMPLEX(16) :: X end</pre>

continued



**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
LOG10	<div>Common logarithm.</div> <div><b>Class.</b> generic elemental function</div> <div><b>Summary.</b></div> <div>generic LOG10(X)</div> <div>REAL function ALOG10(X)</div> <div>REAL ::X</div> <div>DOUBLE PRECISION function</div> <div>DLOG10(X)</div> <div>DOUBLE PRECISION ::X</div> <div>REAL(16) function QLOG10(X)</div> <div>REAL(16) :: X</div> <div>end</div> <div>continued</div>

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
LOGICAL	<p>Convert to logical type.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre> generic LOGICAL(L,KIND)     LOGICAL(KIND) function     LOGICAL(L,KIND)         LOGICAL(1) ::L         INTEGER,OPTIONAL ::KIND     LOGICAL(KIND) function     LOGICAL(L,KIND)         LOGICAL(2) ::L         INTEGER,OPTIONAL ::KIND     LOGICAL(KIND) function     LOGICAL(L,KIND)         LOGICAL(4) ::L         INTEGER,OPTIONAL ::KIND     LOGICAL(KIND) function     LOGICAL(L,KIND)         LOGICAL(8) ::L         INTEGER,OPTIONAL ::KIND     LOGICAL function LOGICAL(L)         LOGICAL(1) ::L     LOGICAL function LOGICAL(L)         LOGICAL(2) ::L     LOGICAL function LOGICAL(L)         LOGICAL(4) ::L     LOGICAL function LOGICAL(L)         LOGICAL(8) ::L end </pre>

continued

Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
LSHFT	<div>Left shift.</div> <div><b>Class.</b> generic elemental nonstandard function</div> <div><b>Summary.</b></div> <div><pre>generic LSHFT(I,SHIFT)     INTEGER(1) function     LSHFT(I,SHIFT)         INTEGER(1) ::I,SHIFT     INTEGER(2) function     LSHFT(I,SHIFT)         INTEGER(2) ::I,SHIFT     INTEGER(4) function     LSHFT(I,SHIFT)         INTEGER(4) ::I,SHIFT     INTEGER(8) function     LSHFT(I,SHIFT)         INTEGER(8) ::I,SHIFT end</pre></div> <div><b>Note:</b> SHIFT must be a positive integer expression of the same KIND as I.</div>

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
LSHIFT	<p>Left shift.</p> <p><b>Class.</b> generic elemental nonstandard function</p> <p><b>Summary.</b></p> <pre> generic LSHIFT(I,SHIFT)     INTEGER(1) function     LSHIFT(I,SHIFT)         INTEGER(1) ::I,SHIFT     INTEGER(2) function     LSHIFT(I,SHIFT)         INTEGER(2) ::I,SHIFT     INTEGER(4) function     LSHIFT(I,SHIFT)         INTEGER(4) ::I,SHIFT     INTEGER(8) function     LSHIFT(I,SHIFT)         INTEGER(8) ::I,SHIFT end </pre> <p><b>Note:</b> SHIFT must be a positive integer expression of the same KIND as I.</p>
MALLOC ( I )	<p>The starting address for the block of memory.</p> <p><b>Class.</b> elemental nonstandard function</p>

continued

Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
MATMUL	<p>Matrix multiply.</p> <p><b>Class.</b> generic transformational function</p> <p><b>Summary.</b></p> <pre>generic MATMAL(MATRIX_A,MATRIX_B)</pre> <p><b>Notes.</b></p> <p>MATRIX_A must be of numeric type or of logical type and must be array-valued and of rank one or two.</p> <p>MATRIX_B must be of numeric type if MATRIX_A is of numeric type, or of logical type if MATRIX_A is of logical type. If MATRIX_A has rank one, MATRIX_B must have rank two; if MATRIX_A has rank two, MATRIX_B must have rank one.</p> <p>If the arguments are logical, the result is of type logical.</p> <p>If the arguments are of numeric type, the result has numeric type.</p>
MAX	<p>Maximum value.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre>generic MAX(A1,A2,...)       REAL function       AIMAX0(A1,A2,...)       INTEGER(2) ::A1,A2,...       REAL function       AJMAX0(A1,A2,...)       INTEGER(4) ::A1,A2,...       REAL function       AKMAX0(A1,A2,...)       INTEGER(8) ::A1,A2,...       REAL function AMAX0(A1,A2,...)       INTEGER ::A1,A2,...       INTEGER(2) function       IMAX1(A1,A2,...)       REAL ::A1,A2,...       INTEGER(4) function       JMAX1(A1,A2,...)</pre>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
MAX (continued)	<pre> REAL ::A1,A2,... INTEGER function MAX1(A1,A2,...) REAL ::A1,A2,... INTEGER(8) function KMAX1(A1,A2,...) REAL ::A1,A2,... INTEGER(1) function MAX(A1,A2,...) INTEGER(1) ::A1,A2,... INTEGER(2) function  IMAX0(A1,A2,...) INTEGER(2) ::A1,A2,... INTEGER(4) function JMAX0(A1,A2,...) INTEGER(4) ::A1,A2,... INTEGER function MAX0(A1,A2,...) INTEGER ::A1,A2, ... INTEGER(8) function KMAX0(A1,A2,...) INTEGER(8) ::A1,A2,... REAL function AMAX1(A1,A2,...) REAL ::A1,A2,... DOUBLE PRECISION function XMAX1(A1,A2,...) DOUBLE PRECISION ::A1,A2,... end </pre>

continued

Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
MAX0	see <a href="#">“MAX(A1, A2, A3, …)”</a>
MAX1	see <a href="#">“MAX(A1, A2, A3, …)”</a>
MAXEXPONENT	<p>Return the maximum exponent in the model representing numbers of the same type and kind type parameter as the argument.</p> <p><b>Class.</b> generic inquiry function</p> <p><b>Summary.</b></p> <pre>generic MAXEXPONENT(X)     INTEGER function     MAXEXPONENT(X)     REAL ::X     INTEGER function     MAXEXPONENT(X)     DOUBLE PRECISION ::X     INTEGER function MAXEXPONENT(X)     REAL(16) :: X end</pre>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
MAXLOC	<p>Return location of the first element of an array having the maximum value of elements identified by MASK.</p> <p><b>Class.</b> generic transformational function</p> <p><b>Summary.</b></p> <pre> generic MAXLOC (ARRAY, MASK)     ! ARRAY must be array-valued     INTEGER function     MAXLOC (ARRAY, MASK)         INTEGER (1) :: ARRAY;     LOGICAL, OPTIONAL :: MASK     INTEGER function     MAXLOC (ARRAY, MASK)         INTEGER (2) :: ARRAY;     LOGICAL, OPTIONAL :: MASK     INTEGER function     MAXLOC (ARRAY, MASK)         INTEGER (4) :: ARRAY;     LOGICAL, OPTIONAL :: MASK     INTEGER function     MAXLOC (ARRAY, MASK)         INTEGER (8) :: ARRAY;     LOGICAL, OPTIONAL :: MASK     INTEGER function     MAXLOC (ARRAY, MASK)         REAL (4) :: ARRAY;     LOGICAL, OPTIONAL :: MASK     INTEGER function     MAXLOC (ARRAY, MASK)         REAL (8) :: ARRAY;     LOGICAL, OPTIONAL :: MASK     INTEGER function </pre>

continued



Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
MAXLOC (continued)	<pre>MAXLOC (ARRAY, MASK)       REAL(16) :: ARRAY;       LOGICAL, OPTIONAL :: MASK       INTEGER function MAXLOC (ARRAY, MASK) end</pre>
MAXVAL	<p>Maximum value of elements of array along dimension DIM that correspond to .TRUE. elements of MASK.</p> <p><b>Class.</b> generic transformational function</p> <p><b>Summary.</b></p> <pre>generic MAXVAL (ARRAY, MASK, DIM)       ! ARRAY must be array-valued       INTEGER(1) function MAXVAL (ARRAY, DIM, MASK)       INTEGER(1) :: ARRAY       INTEGER, OPTIONAL :: DIM       LOGICAL, OPTIONAL :: MASK       INTEGER(2) function MAXVAL (ARRAY, DIM, MASK)       INTEGER(2) :: ARRAY       INTEGER, OPTIONAL :: DIM       LOGICAL, OPTIONAL :: MASK       INTEGER(4) function MAXVAL (ARRAY, DIM, MASK)       INTEGER(4) :: ARRAY       INTEGER, OPTIONAL :: DIM       LOGICAL, OPTIONAL :: MASK       INTEGER(8) function</pre>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
MAXVAL (continued)	<pre> MAXVAL (ARRAY, DIM, MASK)       INTEGER (8) :: ARRAY       INTEGER, OPTIONAL :: DIM       LOGICAL, OPTIONAL :: MASK       REAL (4) function MAXVAL (ARRAY, DIM, MASK)       REAL (4) :: ARRAY       INTEGER, OPTIONAL :: DIM       LOGICAL, OPTIONAL :: MASK       REAL (8) function MAXVAL (ARRAY, DIM, MASK)       REAL (8) :: ARRAY       INTEGER, OPTIONAL :: DIM       LOGICAL, OPTIONAL :: MASK       REAL (16) function MAXVAL (ARRAY, DIM, MASK)       REAL (16) :: ARRAY       INTEGER, OPTIONAL :: DIM       LOGICAL, OPTIONAL :: MASK end </pre>
MCLOCK	<p>Return time accounting for a program.</p> <p><b>Class.</b> specific inquiry nonstandard function</p> <p><b>Summary.</b></p> <pre> INTEGER function MCLOCK() </pre>
MERGE	<p>Choose alternative value according to the value of a mask.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre> generic MERGE (TSOURCE, FSOURCE, MASK) </pre> <p>TSOURCE may be of any type.</p> <p>FSOURCE must be of the same type as TSOURCE.</p> <p>MASK must be type logical.</p>

continued

Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
MIN	<div>Minimum value.</div> <div><b>Class.</b> generic elemental function</div> <div><b>Summary.</b></div> <div>generic MIN(A1,A2,...)</div> <div>REAL function</div> <div>AIMINO(A1,A2,...)</div> <div>INTEGER(2) ::A1,A2,...</div> <div>REAL function</div> <div>AJMINO(A1,A2,...)</div> <div>INTEGER(4) ::A1,A2,...</div> <div>REAL function</div> <div>AKMINO(A1,A2,...)</div> <div>INTEGER(8) ::A1,A2,...</div> <div>REAL function AMINO(A1,A2,...)</div> <div>INTEGER ::A1,A2,...</div> <div>INTEGER(2) function</div> <div>IMIN1(A1,A2,...)</div> <div>REAL ::A1,A2,...</div> <div>INTEGER(4) function</div> <div>JMIN1(A1,A2,...)</div> <div>REAL ::A1,A2,...</div> <div>INTEGER function</div> <div>MIN1(A1,A2,...)</div> <div>REAL ::A1,A2,...</div> <div>INTEGER(8) function</div> <div>KMIN1(A1,A2,...)</div> <div>REAL ::A1,A2,...</div> <div>INTEGER(1) function</div> <div>MIN(A1,A2,...)</div> <div>INTEGER(1) ::A1,A2,...</div> <div>INTEGER(2) function</div> <div>IMINO(A1,A2,...)</div>

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
MIN (continued)	<pre> INTEGER(2) ::A1,A2,... INTEGER(4) function JMIN0(A1,A2,...)     INTEGER(4) ::A1,A2,...     INTEGER function     MIN0(A1,A2,...)         INTEGER ::A1,A2,...     INTEGER(8) function     KMIN0(A1,A2,...)         INTEGER(8) ::A1,A2,...     REAL function AMIN1(A1,A2,...)         REAL ::A1,A2,...     DOUBLE PRECISION function     DMIN1(A1,A2,...)         DOUBLE    PRECISION         ::A1,A2,...     REAL(16) function     QMIN1(A1,A2,...)         REAL(16) :: A1,A2,... end </pre>
MIN0	see <a href="#">“MIN(A1, A2, A3, ...)”</a>
MIN1	see <a href="#">“MIN(A1, A2, A3, ...)”</a>

continued

Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
MINEXPONENT	<p>Return the minimum exponent in the model representing numbers of the same type and kind type parameter as the argument.</p> <p><b>Class.</b> generic inquiry function</p> <p><b>Summary.</b></p> <pre>generic MINEXPONENT(X)     INTEGER function     MINEXPONENT(X)         REAL ::X         INTEGER function     MINEXPONENT(X)         DOUBLE PRECISION ::XINTEGER function MINEXPONENT(X)     REAL(16) :: X end</pre>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
MINLOC	<p>Return location of the first element of an array having the minimum value of elements identified by MASK.</p> <p><b>Class.</b> generic transformational function</p> <p><b>Summary.</b></p> <pre> generic MINLOC (ARRAY, MASK)     ! ARRAY must be array-valued     INTEGER function     MINLOC (ARRAY, MASK)         INTEGER(1) :: ARRAY         LOGICAL, OPTIONAL :: MASK     INTEGER function     MINLOC (ARRAY, MASK)         INTEGER(2) :: ARRAY         LOGICAL, OPTIONAL :: MASK     INTEGER function     MINLOC (ARRAY, MASK)         INTEGER(4) :: ARRAY         LOGICAL, OPTIONAL :: MASK     INTEGER function     MINLOC (ARRAY, MASK)         INTEGER(8) :: ARRAY         LOGICAL, OPTIONAL :: MASK     INTEGER function     MINLOC (ARRAY, MASK)         REAL(4) :: ARRAY         LOGICAL, OPTIONAL :: MASK     INTEGER function </pre>

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
MINLOC (continued)	<pre>MINLOC (ARRAY, MASK)       REAL (8) :: ARRAY       LOGICAL, OPTIONAL :: MASK       INTEGER function       MINLOC (ARRAY, MASK)       REAL (16) :: ARRAY       LOGICAL, OPTIONAL :: MASK</pre>
MINVAL	<p>Minimum value of elements of array along dimension DIM that correspond to .TRUE. elements of MASK.</p> <p><b>Class.</b> generic transformational function</p> <p><b>Summary.</b></p> <pre>generic MINVAL (ARRAY, MASK, DIM)       ! ARRAY must be array-valued       INTEGER (1) function       MINVAL (ARRAY, DIM, MASK)       INTEGER (1) :: ARRAY       INTEGER, OPTIONAL :: DIM;       LOGICAL, OPTIONAL :: MASK       INTEGER (2) function       MINVAL (ARRAY, DIM, MASK)       INTEGER (2) :: ARRAY       INTEGER, OPTIONAL :: DIM;       LOGICAL, OPTIONAL :: MASK       INTEGER (4) function       MINVAL (ARRAY, DIM, MASK)       INTEGER (4) :: ARRAY       INTEGER, OPTIONAL :: DIM;       LOGICAL, OPTIONAL :: MASK       INTEGER (8) function       MINVAL (ARRAY, DIM, MASK)       INTEGER (8) :: ARRAY</pre>

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
MINVAL - (continued)	<div> <div> <div>INTEGER,OPTIONAL ::DIM;</div> <div>LOGICAL,OPTIONAL ::MASK</div> <div>REAL function</div> <div>MINVAL(ARRAY,DIM,MASK)</div> <div>REAL ::ARRAY</div> <div>INTEGER,OPTIONAL ::DIM;</div> <div>LOGICAL,OPTIONAL ::MASK</div> <div>REAL(8) function</div> <div>MINVAL(ARRAY,DIM,MASK)</div> <div>DOUBLE PRECISION ::ARRAY</div> <div>INTEGER,OPTIONAL ::DIM;</div> <div>LOGICAL,OPTIONAL ::MASK</div> <div>REAL(16) function</div> <div>MINVAL(ARRAY,DIM,MASK)</div> <div>REAL(16) ::ARRAY</div> <div>INTEGER,OPTIONAL ::DIM;</div> <div>LOGICAL,OPTIONAL ::MASK</div> </div> <div>end</div> </div>
	continued



Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
MOD	<div>Remainder function.</div> <div><b>Class.</b> generic elemental function</div> <div><b>Summary.</b></div> <div><pre>generic MOD(A,P)     INTEGER(1) function BMOD(A,P)         INTEGER(1) ::A,P     LOGICAL(1) function BMOD(A,P)         LOGICAL(1) ::A,P     INTEGER(2) function HMOD(A,P)         INTEGER(2) ::A,P     INTEGER(2) function IMOD(A,P)         INTEGER(2) ::A,P     INTEGER(4) function JMOD(A,P)         INTEGER(4) ::A,P     INTEGER(8) function KMOD(A,P)         INTEGER(8) ::A,P     REAL function AMOD(A,P)         REAL ::A,P     DOUBLE PRECISION function DMOD(A,P)         DOUBLE PRECISION ::A,P     REAL(16) function QMOD(A,P)         REAL(16) :: A,P end</pre></div>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
MODULO	<p>Modulo function.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre> generic MODULO(A,P)     INTEGER(1) function MODULO(A,P)     INTEGER(1) ::A,P     INTEGER(2) function MODULO(A,P)     INTEGER(2) ::A,P     INTEGER(4) function MODULO(A,P)     INTEGER(4) ::A,P     INTEGER(8) function MODULO(A,P)     INTEGER(8) ::A,P     REAL function MODULO(A,P)     REAL ::A,P     DOUBLE PRECISION function MODULO(A,P)     DOUBLE PRECISION ::A,P end </pre>

continued

Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
MVBITS	<p>Copy a sequence of bits from one data object to another.</p> <p><b>Class.</b> generic elemental subroutine</p> <p><b>Summary.</b></p> <pre>generic MVBITS(FROM, FROMPOS, LEN, TO, TOPOS)     subroutine     BMVBITS(FROM, FROMPOS, LEN, TO, TOPOS)     S)          INTEGER(1):: FROM, TO         INTEGER :: FROMPOS, TOPOS, LEN     subroutine     BMVBITS(FROM, FROMPOS, LEN, TO, TOPOS)     S)          INTEGER(2):: FROM, TO         INTEGER :: FROMPOS, TOPOS, LEN     subroutine     MVBITS(FROM, FROMPOS, LEN, TO, TOPOS)     )          INTEGER(4):: FROM, TO         INTEGER :: FROMPOS, TOPOS, LEN     subroutine     MVBITS(FROM, FROMPOS, LEN, TO, TOPOS)     )          INTEGER(8):: FROM, TO         INTEGER :: FROMPOS, TOPOS, LEN end</pre>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
NEAREST	<p>Return the nearest different machine representable number in a given direction.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre> generic NEAREST(X,S)     REAL function NEAREST(X,S)         REAL ::X,S     DOUBLE PRECISION function     NEAREST(X,S)         DOUBLE PRECISION ::X,S     REAL(16) function NEAREST(X,S)         REAL(16) :: X,S     end </pre>
NINT	<p>Nearest integer.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre> generic NINT(A,KIND)     INTEGER(KIND) function     NINT(A,KIND)         REAL ::A;     INTEGER,OPTIONAL::KIND     INTEGER(KIND) function     NINT(A,KIND)     DOUBLE PRECISION ::A; </pre>

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
NINT (continued)	<div>Nearest integer.</div> <div><b>Class.</b> generic elemental function</div> <div><b>Summary.</b></div> <div><pre>INTEGER,OPTIONAL::KIND   INTEGER function IDNINT(A)     DOUBLE PRECISION::A INTEGER(2) function ININT(A)   REAL A INTEGER(4) function NINT(A)   REAL ::A INTEGER(2) function IIDNNT(A)   DOUBLE PRECISION::A INTEGER(2) function IIQNNT(A)   REAL(16) :: A INTEGER(4) function JNINT(A)   REAL ::A INTEGER(4) function JIDNNT(A)   DOUBLE PRECISION::A INTEGER(4) function IQNINT(A)   REAL(16) :: A INTEGER(8) function KNINT(A)   REAL ::A INTEGER(8) function KIDNNT(A)   DOUBLE PRECISION::A INTEGER(8) function KIQNNT(A)   REAL(16) A</pre></div> <div>end</div>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
NOT	<p>Bitwise complement.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre> generic NOT(I)     INTEGER(1) function BNOT(I)         INTEGER(1) ::I     INTEGER(2) function HNOT(I)         INTEGER(2) ::I     INTEGER(2) function INOT(I)         INTEGER(2) ::I     INTEGER(4) function JNOT(I)         INTEGER(4) ::I     INTEGER(8) function KNOT(I)         INTEGER(8) ::I end </pre>
OR	<p>Bitwise logical OR.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre> generic OR(I,J)     INTEGER(1) function OR(I,J)         INTEGER(1) ::I,J     INTEGER(2) function OR(I,J)         INTEGER(2) ::I,J     INTEGER(4) function OR(I,J)         INTEGER(4) ::I,J     INTEGER(8) function OR(I,J)         INTEGER(8) ::I,J end </pre>

continued

Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
PACK	<p>Pack an array into an array of rank one under control of a mask.</p> <p><b>Class.</b> generic transformational function</p> <p><b>Summary.</b></p> <p>generic PACK(ARRAY,MASK,VECTOR)</p> <p>Notes.</p> <p>ARRAY may be of any type; it must be array-valued.</p> <p>MASK must be of type logical and must be conformable with ARRAY.</p> <p>VECTOR is optional. It must be of same type as ARRAY and must be scalar.</p> <p>The result is an array of rank one with the same type as ARRAY.</p>
PRECISION	<p>Return the decimal precision in the model representing real numbers with the same kind type parameter as the argument.</p> <p><b>Class.</b> generic inquiry function</p> <p><b>Summary.</b></p> <p>generic PRECISION(X)</p> <pre>INTEGER function PRECISION(X)   REAL ::X   INTEGER function PRECISION(X)   DOUBLE PRECISION ::X   INTEGER function PRECISION(X)   REAL(16) :: X end</pre>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
MM_PREFETCH	<p>Prefetch the cache line containing R into the cache. Integer literal I selects the type of prefetch.</p> <p><b>Class.</b> nonstandard function</p> <p><b>Summary.</b></p> <pre> SUBROUTINE MM_PREFETCH(R, I)     REAL R     INTEGER I      I=0 ==&gt; PREFETCH     I=1 ==&gt; PREFETCHTNT1     I=2 ==&gt; PREFETCHTNT2     I=3 ==&gt; PREFETCHTNTA </pre>
MM_PREFETCH	<p>Prefetch the cache line containing D into the cache. Integer literal I selects the type of prefetch.</p> <p><b>Class.</b> nonstandard function</p> <p><b>Summary.</b></p> <pre> SUBROUTINE MM_PREFETCH(D, I)     DOUBLE PRECISION D     INTEGER I      I=0 ==&gt; PREFETCH     I=1 ==&gt; PREFETCHTNT1     I=2 ==&gt; PREFETCHTNT2     I=3 ==&gt; PREFETCHTNTA </pre>

continued



**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
PRESENT	Determine whether an optional argument is present. <b>Class.</b> generic inquiry function <b>Summary.</b> generic PRESENT(A) Notes.  A may be of any type. It must be an optional argument of the procedure in which PRESENT function reference appears. The result has type LOGICAL.

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
PRODUCT	<p>Product of all elements of an array along dimension DIM corresponding to the .TRUE. elements of MASK.</p> <p><b>Class.</b> generic transformational function</p> <p><b>Summary.</b></p> <pre> generic PRODUCT (ARRAY,DIM,MASK)     !ARRAY must be array-valued, DIM     must be scalar     INTEGER(1) function     PRODUCT (ARRAY,DIM,MASK)         INTEGER(1) ::ARRAY         INTEGER,OPTIONAL ::DIM;     LOGICAL,OPTIONAL ::MASK     INTEGER(2) function     PRODUCT (ARRAY,DIM,MASK)         INTEGER(2) ::ARRAY         INTEGER,OPTIONAL ::DIM;     LOGICAL,OPTIONAL ::MASK     INTEGER(4) function     PRODUCT (ARRAY,DIM,MASK)         INTEGER(4) ::ARRAY         INTEGER,OPTIONAL ::DIM;     LOGICAL,OPTIONAL ::MASK     INTEGER(8) function     PRODUCT (ARRAY,DIM,MASK)         INTEGER(8) ::ARRAY         INTEGER,OPTIONAL ::DIM;     LOGICAL,OPTIONAL ::MASK     REAL(4) function     PRODUCT (ARRAY,DIM,MASK)         REAL(4) ::ARRAY </pre>

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
PRODUCT (continued)	INTEGER,OPTIONAL ::DIM; LOGICAL,OPTIONAL ::MASK REAL(8) function PRODUCT(ARRAY,DIM,MASK) REAL(8) ::ARRAY INTEGER,OPTIONAL ::DIM; LOGICAL,OPTIONAL ::MASK LOGICAL,OPTIONAL ::MASK  end
QABS	see <a href="#">“ABS(A)”</a>
QACOS	see <a href="#">“ACOS(X)”</a>
QACOSD	see <a href="#">“ACOSD(X)”</a>
QACOSH	see <a href="#">“ACOSH(X)”</a>
QASIN	see <a href="#">“ASIN(X)”</a>
QASIND	see <a href="#">“ASIND(X)”</a>
QASINH	see <a href="#">“ASINH(X)”</a>
QATAN	see <a href="#">“ATAN(X)”</a>
QATAN2	see <a href="#">“ATAN2(Y, X)”</a>
QATAN2D	see <a href="#">“ATAN2D(Y, X)”</a>
QATAND	see <a href="#">“ATAND(X)”</a>
QATANH	see <a href="#">“ATANH(X)”</a>
QCOS	see <a href="#">“COS(X)”</a>
QCOSD	see <a href="#">“COSD(X)”</a>
QCOSH	see <a href="#">“COSH(X)”</a>
QDIM	see <a href="#">“DIM(X, Y)”</a>
QEXP	see <a href="#">“EXP(X)”</a>
QINT	see <a href="#">“AINT(A, KIND)”</a>
QLOG	see <a href="#">“LOG(X)”</a>
QLOG10	see <a href="#">“LOG10(X)”</a>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
QMAX1	see <a href="#">“MAX(A1, A2, A3, ...)”</a>
QMIN1	see <a href="#">“MIN(A1, A2, A3, ...)”</a>
QMOD	see <a href="#">“MOD(A, P)”</a>
QNINT	see <a href="#">“ANINT(A, KIND)”</a>
QPROD	<p>Quad precision double product.</p> <p><b>Class.</b> generic elemental nonstandard function</p> <p><b>Summary.</b></p> <pre>generic QPROD(X,Y)       DOUBLE PRECISION ::X,Y       end</pre>
QSIGN	see <a href="#">“SIGN(A, B)”</a>
QSIN	see <a href="#">“SIN(X)”</a>
QSIND	see <a href="#">“SIND(X)”</a>
QSINH	see <a href="#">“SINH(X)”</a>
QSQRT	see <a href="#">“SQRT(X)”</a>
QTAN	see <a href="#">“TAN(X)”</a>
QTAND	see <a href="#">“TAND(X)”</a>
QTANH	see <a href="#">“TANH(X)”</a>

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
RADIX	<p>Return the base of the model representing numbers of the same type and kind type parameter as the argument.</p> <p><b>Class.</b> generic inquiry function</p> <p><b>Summary.</b></p> <pre>generic RADIX(X)     INTEGER function RADIX(X)         INTEGER(1) ::X     INTEGER function RADIX(X)         INTEGER(2) ::X     INTEGER function RADIX(X)         INTEGER(4) ::X     INTEGER function RADIX(X)         INTEGER(8) ::X     INTEGER function RADIX(X)         REAL ::X     INTEGER function RADIX(X)         DOUBLE PRECISION ::X end</pre>
RANDOM_NUMBER	<p>Generate pseudorandom number in the range of 0. to 1.</p> <p><b>Class.</b> generic subroutine</p> <p><b>Summary.</b></p> <pre>generic RANDOM_NUMBER(HARVEST)     subroutine     RANDOM_NUMBER(HARVEST)         REAL ::HARVEST     subroutine     RANDOM_NUMBER(HARVEST)         DOUBLE PRECISION ::HARVEST end</pre>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
RANDOM_SEED	<p>Restart or query the pseudorandom number generator used by RANDOM_NUMBER.</p> <p><b>Class.</b> generic subroutine</p> <p><b>Summary.</b></p> <pre> generic RANDOM_SEED(SIZE,PUT,GET)     ! There must be exactly one or no     arguments     !     ! PUT and GET must be a rank-one     and     ! must be of sufficient size     subroutine     RANDOM_SEED(SIZE,PUT,GET)         INTEGER,OPTIONAL         ::SIZE,PUT,GET     end </pre>

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
RANGE	<div><p>Return the decimal exponent range in the model representing integer or real numbers with the same kind type parameter as the argument.</p><p><b>Class.</b> generic inquiry function</p><p><b>Summary.</b></p><pre>generic RANGE(X)     INTEGER function RANGE(X)         INTEGER(1) ::X     INTEGER function RANGE(X)         INTEGER(2) ::X     INTEGER function RANGE(X)         INTEGER(4) ::X     INTEGER function RANGE(X)         INTEGER(8) ::X     INTEGER function RANGE(X)         REAL(4) ::X     INTEGER function RANGE(X)         REAL(8) ::X end</pre></div>

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
REAL	<p>Convert to real type.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre> generic REAL(A,KIND)     REAL function FLOAT(A)         INTEGER ::A     REAL function REAL(A)         INTEGER(1) ::A     REAL function FLOATI(A)         INTEGER(2) ::A     REAL function FLOATJ(A)         INTEGER(4) ::A     REAL function FLOATK(A)         INTEGER(8) ::A     REAL function SNGL(A)         REAL ::A     REAL function REAL(A)         REAL ::A     REAL function REAL(A)         DOUBLE PRECISION ::A     REAL function REAL(A)         COMPLEX ::A     REAL function REAL(A)         DOUBLE COMPLEX ::A end </pre>

continued



Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
REPEAT	<p>Concatenate several copies of a string.</p> <p><b>Class.</b> generic transformational function</p> <p><b>Summary.</b></p> <pre>generic REPEAT (STRING, NCOPIES)     CHARACTER function     REPEAT (STRING, NCOPIES)         CHARACTER :: STRING         INTEGER :: NCOPIES end</pre>
RESHAPE	<p>Construct an array of a specified shape from the elements of a given array.</p> <p><b>Class.</b> generic transformational function</p> <p><b>Summary.</b></p> <pre>generic RESHAPE (SOURCE, SHAPE, PAD, ORDER)</pre> <p>Notes.</p> <p>SOURCE may be of any type. It must be array-valued.</p> <p>SHAPE must be of type integer, rank one and constant size.</p> <p>PAD is optional. It must have the same type as SOURCE.</p> <p>ORDER is optional. It must be of type integer.</p> <p>The result has the same type as SOURCE.</p>
RNUM	<p>Convert character to real type.</p> <p><b>Class.</b> specific elemental nonstandard function</p> <p><b>Summary.</b></p> <pre>REAL function RNUM(I)     CHARACTER :: I</pre>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
RRSPACING	<p>Return the reciprocal of the relative spacing of model numbers near the argument value.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre> generic RRSPACING(X)     REAL function RRSPACING(X)         REAL ::X     DOUBLE PRECISION function RRSPACING(X)         DOUBLE PRECISION ::X     REAL(16) RRSPACING(X)         REAL(16) :: X end </pre>
RSHFT	<p>Bitwise right shift.</p> <p><b>Class.</b> generic elemental nonstandard function</p> <p><b>Summary.</b></p> <pre> generic RSHIFT(I,SHIFT)     INTEGER(1) function RSHFT(I,SHIFT)         INTEGER(1) ::I,SHIFT     INTEGER(2) function RSHFT(I,SHIFT)         INTEGER(2) ::I,SHIFT     INTEGER(4) function RSHFT(I,SHIFT)         INTEGER(4) ::I,SHIFT     INTEGER(8) function RSHFT(I,SHIFT)         INTEGER(8) ::I,SHIFT end </pre> <p><b>Note:</b> SHIFT must be a positive integer of the same KIND as I.</p>

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
RSHIFT	<p>Bitwise right shift.</p> <p><b>Class.</b> generic elemental nonstandard function</p> <p><b>Summary.</b></p> <pre>generic RSHIFT(I,SHIFT)     INTEGER(1) function     RSHIFT(I,SHIFT)         INTEGER(1) ::I,SHIFT     INTEGER(2) function     RSHIFT(I,SHIFT)         INTEGER(2) ::I,SHIFT     INTEGER(4) function     RSHIFT(I,SHIFT)         INTEGER(4) ::I,SHIFT     INTEGER(8) function     RSHIFT(I,SHIFT)         INTEGER(8) ::I,SHIFT end</pre> <p><b>Note:</b> SHIFT must be a positive integer of the same KIND as I.</p>
SCALE	<p>Return <math>X * (b^{**}I)</math> where b is the base in the model representation of X.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre>generic SCALE(X,I)     REAL function SCALE(X,I)         REAL ::X; INTEGER ::I     DOUBLE PRECISION function     SCALE(X,I)     DOUBLE PRECISION ::X; INTEGER ::I     REAL(16) function SCALE(X,I)         REAL(16) :: X         INTEGER::I end</pre>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
SCAN	<p>Scan a string for any one of the characters in a set of characters.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre>generic SCAN(STRING,SET,BACK)     INTEGER function     SCAN(STRING,SET,BACK)         CHARACTER ::STRING,SET         LOGICAL,OPTIONAL :: BACK     end</pre>
SELECTED_INT_KIND	<p>Return the value of the kind type parameter of an integer data type that represents all integer values <math>n</math> with <math>-10^{**r} &lt; n &lt; 10^{**r}</math>.</p> <p><b>Class.</b> generic transformational function</p> <p><b>Summary.</b></p> <pre>generic SELECTED_INT_KIND(R)     INTEGER function     SELECTED_INT_KIND(R)         INTEGER ::R     end</pre>
SELECTED_REAL_KIND	<p>Return the value of the kind type parameter of a real data type with decimal precision of at least <math>P</math> digits and a decimal exponent range of at least <math>R</math>.</p> <p><b>Class.</b> generic transformational function</p> <p><b>Summary.</b></p> <pre>generic SELECTED_REAL_KIND(P,R)     ! At least one argument must be present.     INTEGER function     SELECTED_REAL_KIND(P,R)         INTEGER,OPTIONAL ::P,R     end</pre>

continued

Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
SET_EXPONENT	<p>Return the model number whose fractional part is the fractional part of the model representation of X and whose exponent part is I.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre>generic SET_EXPONENT(X,I)     REAL function     SET_EXPONENT(X,I)         REAL ::X; INTEGER ::I     DOUBLE PRECISION function     SET_EXPONENT(X,I)         DOUBLE PRECISION ::X; INTEGER         ::I     REAL(16) function     SET_EXPONENT(X,I)         REAL(16) :: X         INTEGER :: I end</pre>
SHAPE	<p>Return the shape of an array or a scalar.</p> <p><b>Class.</b> generic inquiry function</p> <p><b>Summary.</b></p> <pre>generic SHAPE(SOURCE)</pre> <p>Notes.</p> <p>SOURCE may be of any type. The result is of type integer and is an array of rank one.</p>

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
SIGN	<p>Absolute value of A times the sign of B.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre> generic SIGN(A,B)     INTEGER(1) function BSIGN(A,B)         INTEGER(1) ::A,B     INTEGER(2) function HSIGN(A,B)         INTEGER(2) ::A,B     INTEGER(2) function     IISIGN(A,B)         INTEGER(2) ::A,B     INTEGER(4) function ISIGN(A,B)         INTEGER(4) ::A,B     INTEGER(4) function JSIGN(A,B)         INTEGER(4) ::A,B     INTEGER(8) function     KISIGN(A,B)         INTEGER(8) ::A,B     REAL function SIGN(A,B)         REAL ::A,B     DOUBLE PRECISION function     DSIGN(A,B)         DOUBLE PRECISION ::A,B     REAL(16) function QSIGN(A,B)         REAL(16) :: A,B end </pre>

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
SIN	<div><p>Sine function that accepts input in radians.</p><p><b>Class.</b> generic elemental function</p><p><b>Summary.</b></p><pre>generic SIN(X)     REAL function SIN(X)         REAL ::X     DOUBLE PRECISION function DSIN(X)     DOUBLE PRECISION ::X     COMPLEX function CSIN(X)         COMPLEX ::X     DOUBLE COMPLEX function CDSIN(X)     DOUBLE COMPLEX ::X     DOUBLE COMPLEX function ZSIN(X)     DOUBLE COMPLEX ::X     REAL(16) function QSIN(X)         REAL(16) X     COMPLEX(16) function CQSIN(X)         COMPLEX(16) ::X end</pre></div>

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
SIND	<p>Sine function that accepts input in degrees.</p> <p><b>Class.</b> generic elemental nonstandard function</p> <p><b>Summary.</b></p> <pre>generic SIND(X)     REAL function SIND(X)         REAL ::X     DOUBLE PRECISION function     DSIND(X)         DOUBLE PRECISION ::X     end</pre>
SINH	<p>Hyperbolic sine function.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre>generic SINH(X)     REAL function SINH(X)         REAL ::X     DOUBLE PRECISION function     DSINH(X)         DOUBLE PRECISION ::X     REAL(16) function QSINH(X)         REAL(16) :: X     end</pre>

continued



Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
SIZE	<p>Return the number of elements of an array or the extent along a specified dimension.</p> <p><b>Class.</b> generic non-standard inquiry function</p> <p><b>Summary.</b></p> <pre>generic SIZE (ARRAY, DIM)</pre> <p>Notes.</p> <div><p>ARRAY may be of any type. It must be array-valued.</p><p>DIM is optional. It must be of type integer and must not be array-valued.</p><p>The result is of type integer.</p></div>
SIZEOF	<p>Return the number of bytes of storage used by the argument.</p> <p><b>Class.</b> generic inquiry function</p> <p><b>Summary.</b></p> <pre>generic SIZEOF (A)</pre> <p><b>Note.</b> A may be of any type. The result is of type integer. If A is a pointer, the function returns the size of what A points to rather than the size of A itself.</p>
SNGL	see REAL
SNGLQ	see REAL
SPACING	<p>Return the absolute spacing of model numbers near the argument value.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre>generic SPACING (X)</pre> <div><pre>REAL function SPACING (X)</pre><pre>REAL :: X</pre><p>DOUBLE PRECISION function</p><pre>SPACING (X)</pre><pre>DOUBLE PRECISION :: X</pre><pre>end</pre></div>

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
SPREAD	<p>Replicate an array by adding a dimension.</p> <p><b>Class.</b> generic transformational function</p> <p><b>Summary.</b></p> <pre>generic SPREAD(SOURCE,DIM,NCOPIES)</pre> <p>Notes.</p> <p>SOURCE may be of any type.</p> <p>DIM must be of type integer and must be scalar.</p> <p>NCOPIES must be of type integer and must be scalar.</p> <p>The result has the same type as SOURCE.</p>

continued

Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
SQRT	<div>Square root.</div> <div><b>Class.</b> generic elemental function</div> <div><b>Summary.</b></div> <div>generic SQRT(X)</div> <div>REAL function SQRT(X)</div> <div>REAL ::X</div> <div>DOUBLE PRECISION function</div> <div>DSQRT(X)</div> <div>DOUBLE PRECISION ::X</div> <div>COMPLEX function CSQRT(X)</div> <div>COMPLEX ::X</div> <div>DOUBLE COMPLEX function</div> <div>CDSQRT(X)</div> <div>DOUBLE COMPLEX ::X</div> <div>DOUBLE COMPLEX function</div> <div>ZSQRT(X)</div> <div>DOUBLE COMPLEX ::X</div> <div>REAL(16) function QSQRT(X)</div> <div>REAL(16) :: X</div> <div>COMPLEX(16) function CQSQRT(X)</div> <div>COMPLEX(16) :: X</div> <div>end</div>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
SUM	<p>Sum all the elements of <code>ARRAY</code> along dimension <code>DIM</code> corresponding to all the <code>.TRUE.</code> elements of <code>MASK</code>.</p> <p><b>Class.</b> generic transformational function</p> <p><b>Summary.</b></p> <pre> generic SUM(ARRAY,MASK,DIM)     ! ARRAY must be array-valued     INTEGER(1) function     SUM(ARRAY,DIM,MASK)         INTEGER(1) ::ARRAY         INTEGER,OPTIONAL ::DIM;     LOGICAL,OPTIONAL ::MASK     INTEGER(2) function     SUM(ARRAY,DIM,MASK)         INTEGER(2) ::ARRAY         INTEGER,OPTIONAL ::DIM;     LOGICAL,OPTIONAL ::MASK     INTEGER(4) function     SUM(ARRAY,DIM,MASK)         INTEGER(4) ::ARRAY         INTEGER,OPTIONAL ::DIM;     LOGICAL,OPTIONAL ::MASK     INTEGER(8) function     SUM(ARRAY,DIM,MASK)         INTEGER(8) ::ARRAY         INTEGER,OPTIONAL ::DIM;     LOGICAL,OPTIONAL ::MASK     REAL(4) function     SUM(ARRAY,DIM,MASK)         REAL(4) ::ARRAY;         INTEGER,OPTIONAL ::DIM;     LOGICAL,OPTIONAL ::MASK end </pre>

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
SUM (continued)	<div>REAL(8) function</div> <div>SUM(ARRAY,DIM,MASK)</div> <div>REAL(8) ::ARRAY</div> <div>INTEGER,OPTIONAL ::DIM;</div> <div>LOGICAL,OPTIONAL ::MASK</div> <div>REAL(16) function</div> <div>SUM(ARRAY,DIM,MASK)</div> <div>REAL(16) ::ARRAY</div> <div>INTEGER,OPTIONAL ::DIM;</div> <div>LOGICAL,OPTIONAL ::MASK</div>
SYSTEM_CLOCK	<div>Return integer data from a real-time clock.</div> <div><b>Class.</b> generic subroutine</div> <div><b>Summary.</b></div> <div>generic</div> <div>SYSTEM_CLOCK( COUNT,COUNT_RATE,COUNT_MAX)</div> <div>subroutine</div> <div>SYSTEM_CLOCK( COUNT,COUNT_RATE,CO</div> <div>UNT_MAX)</div> <div>INTEGER,OPTIONAL</div> <div>::COUNT,COUNT_RATE,COUNT_MAX</div> <div>end</div>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
TAN	<p>Tangent in radians.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre> generic TAN(X)     REAL function TAN(X)         REAL ::X     DOUBLE PRECISION function DTAN(X)     DOUBLE PRECISION ::X     COMPLEX function CTAN(X)         COMPLEX ::X     DOUBLE COMPLEX function ZTAN(X)         DOUBLE COMPLEX ::X     REAL(16) function QTAN(X)         REAL(16) :: X     COMPLEX(16) function CQTAN(X)         COMPLEX(16) :: X end </pre>
TAND	<p>Tangent function that accepts input in degrees.</p> <p><b>Class.</b> generic elemental nonstandard function</p> <p><b>Summary.</b></p> <pre> generic TAND(X)     REAL function TAND(X)         REAL ::X     DOUBLE PRECISION function DTAND(X)     DOUBLE PRECISION ::X     REAL(16) function QTAND(X)         REAL(16) :: X end </pre>

continued

Table 1-3      Generic and Specific Intrinsic Procedures (continued)

Intrinsic Procedure	Description
TANH	<p>Hyperbolic tangent.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre>generic TANH(X)     REAL function TANH(X)         REAL ::X     DOUBLE PRECISION function DTANH(X)     DOUBLE PRECISION ::X     REAL(16) function QTANH         REAL(16) QTANH end</pre>
TINY	<p>Return the smallest positive number in the model representing numbers of the same type and kind type parameter as the argument.</p> <p><b>Class.</b> generic inquiry function</p> <p><b>Summary.</b></p> <pre>generic TINY(X)     REAL function TINY(X)         REAL ::X     DOUBLE PRECISION function TINY(X)     DOUBLE PRECISION ::X     REAL(16) function TINY(X)         REAL(16) :: X end</pre>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
TRANSFER	<p>Return a result with a physical representation identical to that of SOURCE but interpreted with the type and type parameters of MOLD.</p> <p><b>Class.</b> generic transformational function</p> <p><b>Summary.</b></p> <pre>generic TRANSFER(SOURCE,MOLD,SIZE)</pre> <p>Notes.</p> <p>SOURCE may be of any type.</p> <p>MOLD may be of any type.</p> <p>SIZE is optional. It must be a scalar of type integer.</p> <p>The result has the same type as MOLD.</p>
TRANSPOSE	<p>Transpose an array of rank two.</p> <p><b>Class.</b> generic transformational function</p> <p><b>Summary.</b></p> <pre>generic TRANSPOSE(MATRIX)</pre> <p>Notes.</p> <p>MATRIX may be of any type. It must have rank two.</p> <p>The result has the same type as MATRIX.</p>
TRIM	<p>Return the argument with trailing blank characters removed.</p> <p><b>Class.</b> generic transformational function</p> <p><b>Summary.</b></p> <pre>generic TRIM(STRING)       CHARACTER function       TRIM(STRING)       CHARACTER ::STRING end</pre>

continued



**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
UBOUND	Returns upper bounds of an array. <b>Class.</b> generic inquiry function <b>Summary.</b> generic UBOUND(ARRAY,DIM) !ARRAY must be array-valued, DIM must be scalar INTEGER function UBOUND(ARRAY,DIM) LOGICAL(1) ::ARRAY; INTEGER,OPTIONAL ::DIM INTEGER function UBOUND(ARRAY,DIM) LOGICAL(2) ::ARRAY; INTEGER,OPTIONAL ::DIM INTEGER function UBOUND(ARRAY,DIM) LOGICAL(4) ::ARRAY; INTEGER,OPTIONAL ::DIM INTEGER function UBOUND(ARRAY,DIM) LOGICAL(8) ::ARRAY; INTEGER,OPTIONAL ::DIM INTEGER function UBOUND(ARRAY,DIM) INTEGER(1) ::ARRAY; INTEGER,OPTIONAL ::DIM INTEGER function UBOUND(ARRAY,DIM) INTEGER(2) ::ARRAY; INTEGER,OPTIONAL ::DIM INTEGER function UBOUND(ARRAY,DIM) INTEGER(4) ::ARRAY; INTEGER,OPTIONAL ::DIM

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
UBOUND (continued)	<p>INTEGER function UBOUND (ARRAY, DIM)</p> <p>INTEGER (8) :: ARRAY; INTEGER, OPTIONAL :: DIM</p> <p>INTEGER function UBOUND (ARRAY, DIM)</p> <p>REAL (4) :: ARRAY; INTEGER, OPTIONAL :: DIM</p> <p>INTEGER function UBOUND (ARRAY, DIM)</p> <p>REAL (8) :: ARRAY; INTEGER, OPTIONAL :: DIM</p> <p>INTEGER function UBOUND (ARRAY, DIM)</p> <p>REAL (16) :: ARRAY; INTEGER, OPTIONAL :: DIM</p> <p>INTEGER function UBOUND (ARRAY, DIM)</p> <p>COMPLEX (4) :: ARRAY; INTEGER, OPTIONAL :: DIM</p> <p>INTEGER function UBOUND (ARRAY, DIM)</p> <p>COMPLEX (8) :: ARRAY; INTEGER, OPTIONAL :: DIM</p> <p>INTEGER function UBOUND (ARRAY, DIM)</p> <p>COMPLEX (16) :: ARRAY; INTEGER, OPTIONAL :: DIM</p> <p>INTEGER function UBOUND (ARRAY, DIM)</p> <p>CHARACTER :: ARRAY; INTEGER, OPTIONAL :: DIM</p>

continued

**Table 1-3      Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
UBOUND (continued)	<pre>INTEGER function UBOUND (ARRAY, DIM)     DERIVED_TYPE :: ARRAY; INTEGER, OPTIONAL :: DIM end</pre>
UNPACK	<p>Unpack an array of rank one into an array under control of a mask.</p> <p><b>Class.</b> generic transformational function</p> <p><b>Summary.</b></p> <pre>generic UNPACK (VECTOR, MASK, FIELD)</pre> <p>Notes.</p> <p>VECTOR may be of any type. It must have rank one.</p> <p>MASK must have logical type. It must be array-valued.</p> <p>FIELD must be the same type as VECTOR.</p> <p>The result has the same type as VECTOR.</p>
VERIFY	<p>Verify that a set of a characters contains all the characters in a string by identifying the position of the first character that does not appear in a given set of characters.</p> <p><b>Class.</b> generic elemental function</p> <p><b>Summary.</b></p> <pre>generic VERIFY (STRING, SET, BACK)     INTEGER function VERIFY (STRING, SET, BACK)     CHARACTER :: STRING, SET     LOGICAL, OPTIONAL :: BACK end</pre>

continued

**Table 1-3 Generic and Specific Intrinsic Procedures** (continued)

Intrinsic Procedure	Description
XOR	<p>Bitwise exclusive OR.</p> <p><b>Class.</b> generic elemental nonstandard function</p> <p><b>Summary.</b></p> <pre>generic XOR(I,J)     INTEGER(1) function XOR(I,J)         INTEGER(1) ::I,J     INTEGER(2) function XOR(I,J)         INTEGER(2) ::I,J     INTEGER(4) function XOR(I,J)         INTEGER(4) ::I,J     INTEGER(8) function XOR(I,J)         INTEGER(8) ::I,J end</pre> <p><b>Note:</b> this function can also be specified in all its forms as IXOR</p>
ZABS	see ABS
ZCOS	see COS
ZEXP	see EXP
ZLOG	see <u><a href="#">“LOG(X)”</a></u>
ZSIN	see SIN
ZSQRT	see SQRT
ZTAN	see TAN

---

## Intrinsic Procedure Specifications

This section contains detailed specifications of Intel Fortran intrinsic procedures, which are listed in alphabetical order.

For a summary of all generic as well as specific intrinsic procedures, see Table 1-3 in the section “[Generic and Specific Intrinsic Summary](#)”.

All of the intrinsic procedures in this section are generic. This means that each intrinsic procedure may be called with more than one argument type/kind/rank pattern.

In many cases, the kind and type of intrinsic function results are the same as that of the “principal” argument. For example, the `SIN` function may be called with any kind of real argument or any kind of complex argument, and the result has the type and kind of the argument.

Intrinsic procedure references may use keywords, in which case the actual argument expression is preceded by the dummy argument name (the argument keyword) and an “=” symbol. These argument keywords are shown in the following descriptions of the procedures.

Some intrinsic procedure’s arguments are optional. Optional arguments are noted as such in the following descriptions.

---

### ABS(A)

---

#### Description

Absolute value.

#### Class

Elemental function.

#### Argument

A must be of type integer, real, or complex.

**Result Type and Type Parameter**

The same as A except that if A is complex, the result is real.

**Result Value**

If A is of type integer or real, the value of the result is |A|.

If A is complex with value (x, y), the result is equal to a processor-dependent approximation to  $\sqrt{x^2 + y^2}$

**Examples**

ABS(-1) has the value 1.

ABS(-1.5) has the value 1.5.

ABS((3.0, 4.0)) has the value 5.0.

---

**ACHAR(I)**

*Converts an integer to an ASCII representation*

---

**Description**

Returns the character in a specified position of the ASCII collating sequence. It is the inverse of the IACHAR function.

**Class**

Elemental function.

**Argument**

I must be of type integer.

**Result Type and Type Parameter**

Character of length one with kind type parameter value KIND('A').

**Result Value**

If  $\mathcal{I}$  has a value in the range  $0 \leq \mathcal{I} \leq 127$ , the result is the character in position  $\mathcal{I}$  of the ASCII collating sequence, provided the processor is capable of representing that character; otherwise, the result is processor-dependent.

If the processor is not capable of representing both uppercase and lowercase letters and  $\mathcal{I}$  corresponds to a letter in a case that the processor is not capable of representing, the result is the letter in the case that the processor is capable of representing.

$\text{ACHAR}(\text{IACHAR}(\mathcal{C}))$  must have the value  $\mathcal{C}$  for any character  $\mathcal{C}$  capable of representation in the processor.

**Examples**

$\text{ACHAR}(88)$  is 'X'.

$\text{ACHAR}(42)$  is '\*'.

---

## ACOS(X)

---

**Description**

Arccosine (inverse cosine) function in radians.

**Class**

Elemental function.

**Argument**

$x$  must be of type real with a value that satisfies the inequality  $|x| \leq 1$ .

**Result Type and Type Parameter**

Same as  $x$ .

**Result Value**

The result has a value equal to a processor-dependent approximation to  $\arccos(X)$ , expressed in radians. It lies in the range  $0 \leq \text{ACOS}(X) \leq \pi$ .

**Examples**

`ACOS(0.54030231)` has the value 1.0.

`ACOS(.1_HIGH)` has the value 1.4706289056333 with kind HIGH.

---

**ACOSD(X)**

---

**Description**

Arccosine (inverse cosine) in degrees.

**Class**

Elemental nonstandard function.

**Argument**

`x` must be of type real with a value that satisfies the inequality  $|x| \leq 1$ .

**Result Type and Type Parameter**

Same as `x`.

**Result Value**

The result has a value equal to a processor-dependent approximation to  $\arccos(X)$ , expressed in degrees. It lies in the range  $0 \leq \text{ACOSD}(X) \leq 180$ .

**Examples**

`ACOSD(0.0000001)` has the value 89.99999.

`ACOSD(0.5)` has the value 60.0.

`ACOSD(-1.0)` has the value 180.0.



---

## ACOSH(X)

---

### Description

Hyperbolic arccosine of radians.

### Class

Elemental nonstandard function.

### Argument

x must be of type real with a value  $x \geq 1$ .

### Result Type and Type Parameter

Same as x.

### Result Value

The result has a value equal to a processor-dependent approximation to the hyperbolic arccosine of x. It lies in the range  $0 \leq \text{ACOSH}(x)$ .

### Examples

`ACOSH(1.0)` has the value 0.0.

`ACOSH(180.0)` has the value 5.8861.

`ACOSH(0.0)` has the value NaN (not a number).

---

## ADJUSTL(String)

---

### Description

Adjust to the left, removing leading blanks and inserting trailing blanks.

### Class

Elemental function.

### Argument

STRING must be of type character.

### Result Type

Character of the same length and kind type parameter as STRING

### Result Value

The value of the result is the same as STRING except that any leading blanks have been deleted and the same number of trailing blanks have been inserted.

### Example

ADJUSTL(' ~~bb~~WORD') is 'WORD~~bb~~'.

---

## ADJUSTR(String)

---

### Description

Adjust to the right, removing trailing blanks and inserting leading blanks.

### Class

Elemental function.

### Argument

STRING must be of type character.

### Result Type

Character of the same length and kind type parameter as STRING

### Result Value

The value of the result is the same as STRING except that any trailing blanks have been deleted and the same number of leading blanks have been inserted.

### Examples

ADJUSTR('WORD~~bb~~') has the value '~~bb~~WORD'.

---

## AIMAG(Z)

---

### Description

Imaginary part of a complex number.

### Class

Elemental function.

### Argument

z must be of type complex.

### Result Type and Type Parameter

Real with the same kind type parameter as z.

### Result Value

If z has the value  $(x, y)$ , the result has value y.

### Examples

`AIMAG( ( 2.0, 3.0 ) )` has the value 3.0.

`AIMAG( ( 2.0_HIGH, 3.0 ) )` has the value 3.0 with kind `HIGH`; the parts of a complex literal constant have the same precision, which is that of the part with the greater precision.

---

## AINT(A, KIND)

---

### Optional Argument

KIND

### Description

Truncation to a whole number.

### Class

Elemental function.

### Arguments

A                    must be of type real.

KIND (optional)    must be a scalar integer initialization expression.

### Result Type and Type Parameter

The result is of type real. If KIND is present, the kind type parameter is that specified by KIND; otherwise, the kind type parameter is that of A.

### Result Value

If  $|A| < 1$ , AINT(A) has the value 0; if  $A \geq 1$ , AINT(A) has a value equal to the integer whose magnitude is the largest integer that does not exceed the magnitude of A and whose sign is the same as the sign of A.

### Examples

AINT(2.783) has the value 2.0.

AINT(-2.783) has the value -2.0.

AINT(2.1111111111111\_HIGH) and AINT(2.111111111111,  
HIGH) have the value 2.0 with kind HIGH.

---

## ALL(MASK, DIM)

---

### Optional Argument

DIM

### Description

Determine whether all values are `.TRUE.` in MASK along dimension DIM.

### Class

Transformational function.

### Arguments

MASK

must be of type logical. It must not be scalar.

DIM (optional)

must be scalar and of type integer with value in the range  $1 \leq \text{DIM} \leq n$  where  $n$  is the rank of MASK. The corresponding actual argument must not be an optional dummy argument.

### Result Type, Type Parameter, and Shape

The result is of type logical with the same kind type parameter as MASK. It is scalar if DIM is absent or MASK has rank one; otherwise, the result is an array of rank  $n-1$  and of shape  $(d_1, d_2, \dots, d_{\text{DIM}-1}, d_{\text{DIM}+1}, \dots, d_n)$  where  $(d_1, d_2, \dots, d_n)$  is the shape of MASK.

## Result Value

- Case 1      The result of `ALL(MASK)` has the value `.TRUE.` if all elements of `MASK` are `.TRUE.` or if `MASK` has size zero, and the result has value `.FALSE.` if any element of `MASK` is `.FALSE.`.
- Case 2      If `MASK` has rank one, `ALL(MASK, DIM)` has a value equal to that of `ALL(MASK)`. Otherwise, the value of element  $(s_1, s_2, \dots, s_{\text{DIM}-1}, s_{\text{DIM}+1}, \dots, s_n)$  of `ALL(MASK, DIM)` is equal to `ALL(MASK(s1, s2, ..., sDIM-1, :, sDIM+1, ..., sn))`.

## Examples

- Case 1      The value of `ALL((/.TRUE., .FALSE., .TRUE. /))` is `.FALSE.`
- `ALL((/.TRUE._BIT, .TRUE._BIT, .TRUE._BIT /))` is the value `.TRUE._BIT`.

- Case 2      If `B` is the array

$$\begin{bmatrix} 1 & 3 & 5 \\ 2 & 4 & 6 \end{bmatrix}$$

and `C` is the array

$$\begin{bmatrix} 0 & 3 & 5 \\ 7 & 4 & 8 \end{bmatrix}$$

then `ALL(B .NE. C, DIM = 1)` is `[.TRUE., .FALSE., .FALSE.]` and `ALL(B .NE. C, DIM = 2)` is `[.FALSE., .FALSE.]`.

---

## ALLOCATED(ARRAY)

---

### Description

Indicate whether or not an allocatable array is currently allocated.

### Class

Inquiry function.

### Argument

ARRAY must be an allocatable array.

### Result Type, Type Parameter, and Shape

Default logical scalar.

### Result Value

The result has the value `.TRUE.` if ARRAY is currently allocated and has the value `.FALSE.` if ARRAY is not currently allocated. The result is undefined if the allocation status of the array is undefined.

### Example

If the following statements are processed

```
REAL, ALLOCATABLE :: A(:, :)
```

```
ALLOCATE (A(10,10))
```

```
PRINT *, ALLOCATED (A)
```

then **T** is printed.



AND(I, J)

Description

Bitwise AND .

Class

Elemental nonstandard function.

Arguments

- I must be of type integer.
- J must be of type integer with the same kind type parameter as I.

Result Type and Type Parameter

Same as I.

Result Value

The result has the value obtained by performing a bitwise AND on I and J according to the following truth table:

I	J	AND( I , J )
1	1	1
1	0	0
0	1	0
0	0	0

The model for interpreting an integer value as a sequence of bits is in the section “[The Bit Model](#)”.

### Example

The following program produces the output “11 5 1”.

K is assigned the binary value 0001, which is 1 in decimal.

```
PROGRAM andtest
INTEGER I, J, K
  I = B'1011'
  J = B'0101'
  K = AND(I, J)
  PRINT *, I, J, K
END
```

---

## ANINT(A, KIND)

---

### Optional Argument

KIND

### Description

Nearest whole number.

### Class

Elemental function.

### Arguments

A                    must be of type real.

KIND (optional)    must be a scalar integer initialization expression.

### Result Type and Type Parameter

The result is of type real. If `KIND` is present, the kind type parameter is that specified by `KIND`; otherwise, the kind type parameter is that of `A`.

### Result Value

If  $A > 0$ , `ANINT(A)` has the value `AINTE(A+0.5)`; if  $A \leq 0$ , `ANINT(A)` has the value `AINTE(A-0.5)`.

### Examples

`ANINT(2.783)` has the value 3.0.

`ANINT(-2.783)` has the value -3.0.

`ANINT(2.7837837837837_HIGH)` and  
`ANINT(2.7837837837837,HIGH)` have the value 3.0 with kind `HIGH`.

---

## ANY(MASK, DIM)

---

### Optional Argument

`DIM`

### Description

Determine whether any value is `.TRUE.` in `MASK` along dimension `DIM`.

### Class

Transformational function.

### Arguments

`MASK` must be of type logical. It must not be scalar.

`DIM` (optional) must be scalar and of type integer with a value in the range  $1 \leq \text{DIM} \leq n$ , where  $n$  is the rank of `MASK`. The corresponding actual argument must not be an optional dummy argument.

### Result Type, Type Parameter, and Shape

The result is of type logical with the same kind type parameter as `MASK`. It is scalar if `DIM` is absent or `MASK` has rank one; otherwise, the result is an array of rank  $n-1$  and of shape  $(d_1, d_2, \dots, d_{\text{DIM}-1}, d_{\text{DIM}+1}, \dots, d_n)$  where  $(d_1, d_2, \dots, d_n)$  is the shape of `MASK`.

### Result Value

- Case 1 The result of `ANY(MASK)` has the value `.TRUE.` if any element of `MASK` is `.TRUE.` and has the value `.FALSE.` if no elements are `.TRUE.` or if `MASK` has size zero.
- Case 2 If `MASK` has rank one, `ANY(MASK, DIM)` has a value equal to that of `ANY(MASK)`. Otherwise, the value of element  $(s_1, s_2, \dots, s_{\text{DIM}-1}, s_{\text{DIM}+1}, \dots, s_n)$  of `ANY(MASK, DIM)` is equal to `ANY(MASK(s_1, s_2, ..., s_{\text{DIM}-1}, :, s_{\text{DIM}+1}, \dots, s_n))`.

### Examples

- Case 1 The value of `ANY((/.TRUE., .FALSE., .TRUE./))` is `.TRUE.`.
- `ANY((/.FALSE._BIT, .FALSE._BIT, .FALSE._BIT/))` is `.FALSE._BIT`.
- Case 2 If `B` is the array

$$\begin{bmatrix} 1 & 3 & 5 \\ 2 & 4 & 6 \end{bmatrix}$$

and `C` is the array

$$\begin{bmatrix} 0 & 3 & 5 \\ 7 & 4 & 8 \end{bmatrix}$$

```
then ANY(B .NE. C, DIM = 1) is [.TRUE.,  
.FALSE., .TRUE.] and ANY(B .NE. C, DIM = 2) is  
[.TRUE., .TRUE.].
```

---

## ASIN(X)

---

### Description

Arcsine (inverse sine) function in radians.

### Class

Elemental function.

### Argument

x must be of type real. Its value must satisfy the inequality  $|x| \leq 1$ .

### Result Type and Type Parameter

Same as x.

### Result Value

The result has a value equal to a processor-dependent approximation to  $\arcsin(x)$ , expressed in radians. It lies in the range  $-\pi/2 \leq \text{ASIN}(x) \leq \pi/2$ .

### Examples

`ASIN(0.84147098)` has the value 1.0.

`ASIN(1.0_HIGH)` has the value 1.5707963267949 with kind HIGH.

---

## ASIND(X)

---

### Description

Arcsine (inverse sine) function in degrees.

### Class

Elemental nonstandard function.

### Argument

x must be of type real. Its value must satisfy the inequality  $|x| \leq 1$ .

### Result Type and Type Parameter

Same as x.

### Result Value

The result has a value equal to a processor-dependent approximation to  $\arcsin(x)$ , expressed in degrees. It lies in the range  $-90 \leq \text{ASIND}(x) \leq 90$ .

### Examples

`ASIND(-1.0)` has the value -90.0.

`ASIND(0.5)` has the value 30.0.

---

## ASINH(X)

---

### Description

Hyperbolic arcsine of radians.

### Class

Elemental nonstandard function.

### Argument

x must be of type real.

### Result Type and Type Parameter

Same as x.

### Result Value

The result has a value equal to a processor-dependent approximation to the hyperbolic arcsine of x.

### Examples

ASINH( -1.0 ) has the value -0.88137.

ASINH( 180.0 ) has the value 5.88611.

---

## ASSOCIATED(POINTER, TARGET)

---

### Optional Argument

TARGET

### Description

Returns the association status of its pointer argument or indicates the pointer is associated with the target.

### Class

Inquiry function.

### Arguments

POINTER	must be a pointer and may be of any type. Its pointer association status must not be undefined.
TARGET (optional)	must be a pointer or target. If it is a pointer, its pointer association status must not be undefined.

### Result Type

The result is scalar of type default logical.

### Result Value

Case 1	If TARGET is absent, the result is <code>.TRUE.</code> if POINTER is currently associated with a target and <code>.FALSE.</code> if it is not.
Case 2	If TARGET is present and is a target, the result is <code>.TRUE.</code> if POINTER is currently associated with TARGET and <code>.FALSE.</code> if it is not.



Case 3            If `TARGET` is present and is a pointer, the result is  
                  `.TRUE.` if both `POINTER` and `TARGET` are currently  
                  associated with the same target, and is `.FALSE.`  
                  otherwise. If either `POINTER` or `TARGET` is  
                  disassociated, the result is `.FALSE.`.

### Examples

Case 1            `ASSOCIATED(PTR)` is `.TRUE.` if `PTR` is currently  
                  associated with a target.

Case 2            `ASSOCIATED(PTR, TAR)` is `.TRUE.` if the following  
                  statements have been processed:

```
REAL, TARGET :: TAR (0:100)
REAL, POINTER :: PTR(:)
PTR => TAR
```

The subscript range for both `TAR` and `PTR` is 0:100.

If the pointer assignment statement is either

```
PTR => TAR(:)
```

or

```
PTR => TAR(0:100)
```

then `ASSOCIATED(PTR, TAR)` is still `.TRUE.`, but in  
both cases the subscript range for `PTR` is 1:101.

However, if the pointer assignment statement is

```
PTR => TAR(0:99)
```

then `ASSOCIATED(PTR, TAR)` is `.FALSE.`, because  
`TAR(0:99)` is not the same as `TAR`.

## Case 3

ASSOCIATED(PTR1, PTR2) is .TRUE. if the following statements have been processed.

```
REAL, POINTER :: PTR1(:), PTR2(:)
```

```
ALLOCATE(PTR1(0:10))
```

```
PTR2 => PTR1
```

After the execution of either

```
NULLIFY(PTR1)
```

or

```
NULLIFY(PTR2)
```

the statement ASSOCIATED(PTR1, PTR2) evaluates to .FALSE..

---

## ATAN(X)

---

### Description

Arctangent (inverse tangent) function in radians.

### Class

Elemental function.

### Argument

x must be of type real.

### Result Type and Type Parameter

Same as x.

**Result Value**

The result has a value equal to a processor-dependent approximation to  $\arctan(X)$ , expressed in radians, that lies in the range  $-\pi/2 \leq \text{ATAN}(X) \leq \pi/2$ .

**Examples**

`ATAN(1.5574077)` has the value 1.0.

`ATAN(2.0_HIGH/3.0)` has the value 0.58800260354757 with kind `HIGH`.

---

**ATAN2(Y, X)**

---

**Description**

Arctangent (inverse tangent) function in radians. The result is the principal value of the argument of the nonzero complex number (X, Y).

**Class**

Elemental function.

**Arguments**

Y	must be of type real.
X	must be of the same type and kind type parameter as Y. If Y has the value zero, X must not have the value zero.

**Result Type and Type Parameter**

Same as X.

**Result Value**

The result has a value equal to a processor-dependent approximation to the principal value of the argument of the complex number (X, Y), expressed in radians.

The result lies in the range  $-\pi \leq \text{ATAN2}(Y, X) \leq \pi$  and is equal to a processor-dependent approximation to a value of  $\arctan(Y/X)$  if  $X \neq 0$ .

If  $Y > 0$ , the result is positive. If  $Y = 0$ , the result is zero if  $X > 0$  and the result is  $\pi$  if  $X < 0$ . If  $Y < 0$ , the result is negative. If  $X = 0$ , the absolute value of the result is  $\pi/2$ .

**Examples**

$\text{ATAN2}(1.5574077, 1.0)$  has the value 1.0.

If Y has the value

$$\begin{bmatrix} 1 & 1 \\ \text{D}1 & \text{D}1 \end{bmatrix}$$

and X has the value

$$\begin{bmatrix} \text{D}1 & 1 \\ \text{D}1 & 1 \end{bmatrix}$$

then the value of  $\text{ATAN2}(Y, X)$  is

$$\begin{bmatrix} \frac{3\pi}{4} & \frac{\pi}{4} \\ \frac{\text{D}3\pi}{4} & \text{D}\frac{\pi}{4} \end{bmatrix}$$

---

## ATAN2D(Y, X)

---

### Description

Arctangent (inverse tangent) function in degrees.

### Class

Elemental nonstandard function.

### Arguments

Y                    must be of type real.

X                    must be of the same type and kind type parameter as Y.

### Result Type and Type Parameter

Same as X.

### Result Value

The result has a value equal to a processor-dependent approximation to the principal value of the argument of the complex number (X, Y), expressed in degrees, that lies in the range  $-90 < \text{ATAN2D}(Y, X) < 90$ .

### Examples

`ATAN2D(1.0, 1.0)` has the value 45.0.

`ATAN2D(1.0, 0.0)` has the value 90.0.

`ATAN2D(8735.0, 1.0)` has the value 89.99344.

---

## ATAND(X)

---

### Description

Arctangent (inverse tangent) function in degrees.

### Class

Elemental nonstandard function.

### Argument

x must be of type real.

### Result Type and Type Parameter

Same as x.

### Result Value

The result has a value equal to a processor-dependent approximation to  $\arctan(X)$ , expressed in degrees, that lies in the range  $-90 < \text{ATAND}(X) < 90$ .

### Examples

`ATAND(1.0)` has the value 45.0.

`ATAND(0.0)` has the value 0.0.

`ATAND(-94373.0)` has the value -89.9994.

---

## ATANH(X)

---

### Description

Hyperbolic arctangent of radians.

### Class

Elemental nonstandard function.

### Argument

x must be of type real.

### Result Type and Type Parameter

Same as x.

### Result Value

The result has a value equal to a processor-dependent approximation to the hyperbolic arctangent of x.

### Examples

ATANH( 0 . 0 ) has the value 0.0.

ATANH( -0 . 77 ) has the value -1.02033.

ATANH( 0 . 5 ) has the value 0.549306.

---

## BADDRESS(X)

---

### Description

Return the address of x.

### Class

Inquiry nonstandard function.

### Argument

x may be of any type.

### Result Type

The result is of type default integer.

Example.

The following program:

```
PROGRAM batest
  INTEGER X(5), I
  DO I=1, 5
    PRINT *, BADDRESS(X(I))
  END DO
END
```

Could produce this output:

```
2063835808
2063835812
2063835816
2063835820
2063835824
```



---

## BIT\_SIZE(I)

---

### Description

Returns the number of bits  $n$ , defined by the model in the section “[The Bit Model](#)”, for integers with the kind parameter of the argument.

### Class

Inquiry function.

### Argument

$I$  must be of type integer.

### Result Type, Type Parameter, and Shape

Scalar integer with the same kind type parameter as  $I$ .

### Result Value

The result has the value of the number of bits  $n$  in the model integer, defined for bit manipulation contexts in the section “[The Bit Model](#)”, for integers with the kind parameter of the argument.

### Examples

`BIT_SIZE(1)` has the value 32 if  $n$  in the model is 32.

---

## BTEST(I, POS)

---

### Description

Tests a bit of an integer value.

### Class

Elemental function.

### Argument

I	must be of type integer.
POS	must be of type integer. It must be nonnegative and be less than <code>BIT_SIZE(I)</code> .

### Result Type

The result is of type default logical.

### Result Value

The result has the value `.TRUE.` if bit `POS` of `I` has the value 1 and has the value `.FALSE.` if bit `POS` of `I` has the value 0. The model for the interpretation of an integer value as a sequence of bits is in the section “[The Bit Model](#)”.

### Examples

`BTEST(8, 3)` has the value `.TRUE.`.

`BTEST(8_SHORT, 3)` has the value `.TRUE.`.

If `A` has the value `[1, 2, 3, 4]` then the value of `BTEST(A, 2)` is `[.FALSE., .FALSE., .FALSE., .TRUE.]` and the value of `BTEST(2, A)` is `[.TRUE., .FALSE., .FALSE., .FALSE.]`.

---

## CEILING(A)

---

### Description

Returns the least integer greater than or equal to its argument.

### Class

Elemental function.

### Argument

A must be of type real.

### Result Type and Type Parameter

Default integer.

### Result Value

The result has a value equal to the least integer greater than or equal to A.  
The result is undefined if the processor cannot represent this value in the default integer type.

### Examples

`CEILING( 3.7 )` has the value 4.

`CEILING( -3.7 )` has the value -3.

`CEILING( 20.0_HIGH/3 )` has the value 7.

---

## CHAR(I, KIND)

---

### Optional Argument

KIND

### Description

Returns the character in a given position of the processor collating sequence associated with the specified kind type parameter. It is the inverse of the function ICHAR.

### Class

Elemental function.

### Arguments

I                    must be of type integer with a value in the range  $0 \leq I \leq n-1$ , where  $n$  is the number of characters in the collating sequence associated with the specified kind type parameter.

KIND (optional)   must be a scalar integer initialization expression.

### Result Type and Type Parameters

Character of length one. If KIND is present, the kind type parameter is that specified by KIND; otherwise, the kind type parameter is that of default character type.

**Result Value**

The result is the character in position  $I$  of the collating sequence associated with the specified kind type parameter.

$\text{ICHAR}(\text{CHAR}(I, \text{KIND}(C)))$  must have the value  $I$  for  $0 \leq I \leq n-1$  and  $\text{CHAR}(\text{ICHAR}(C), \text{KIND}(C))$  must have the value  $C$  for any character  $C$  capable of representation in the processor.

**Example.**

$\text{CHAR}(88)$  is 'X' on a processor using the ASCII collating sequence.

---

**CMPLX(X, Y, KIND)**


---

**Optional Arguments**

$Y, \text{KIND}$

**Description**

Convert to complex type.

**Class**

Elemental function.

**Arguments**

$X$	must be of type integer, real, or complex.
$Y$ (optional)	must be of type integer or real. It must not be present if $X$ is of type complex.
$\text{KIND}$ (optional)	must be a scalar integer initialization expression.

### Result Type and Type Parameter

The result is of type complex. If `KIND` is present, the kind type parameter is that specified by `KIND`; otherwise, the kind type parameter is that of default real type.

### Result Value

If `Y` is absent and `X` is not complex, it is as if `Y` were present with the value zero.

If `Y` is absent and `X` is complex, it is as if `Y` were present with the value `AIMAG(X)`.

`CMPLX(X,Y,KIND)` has the complex value whose real part is `REAL(X,KIND)` and whose imaginary part is `REAL(Y,KIND)`.

### Examples

`CMPLX(-3)` is  $-3.0 + 0i$ .

`CMPLX((4.1,0.0), KIND=HIGH)`, `CMPLX((4.1,0), KIND=HIGH)`, and `CMPLX(4.1, KIND=HIGH)` are each  $4.1 + 0.0i$  with kind `HIGH`.

---

## CONJG(Z)

---

### Description

Conjugate of a complex number.

### Class

Elemental function.

### Argument

`Z` must be of type complex.

**Result Type and Type Parameter**

Same as  $z$ .

**Result Value**

If  $z$  has the value  $(x, y)$ , the result has the value  $(x, -y)$ .

**Examples**

`CONJG((2.0, 3.0) is (2.0, - 3.0).`

`CONJG((0., -4.1_HIGH)) is 0 + 4.1i with kind HIGH.`

---

**COS(X)**

---

**Description**

Cosine function in radians.

**Class**

Elemental function.

**Argument**

$x$  must be of type real or complex.

**Result Type and Type Parameter**

Same as  $x$ .

**Result Value**

The result has a value equal to a processor-dependent approximation to  $\cos(x)$ . If  $x$  is of type real, it is regarded as a value in radians. If  $x$  is of type complex, its real part is regarded as a value in radians.

**Examples**

`COS(1.0)` has the value 0.54030231.

`COS((1.0_HIGH, 1.0))` has the value:

$0.83373002513115 - 0.98889770576287i$  with kind `HIGH`.

---

## **COSD(X)**

---

**Description**

Cosine function that accepts input in degrees.

**Class**

Elemental nonstandard function.

**Argument**

$x$  must be of type real.

**Result Type and Type Parameter**

Same as  $x$ .



**Result Value**

The result has a value equal to a processor-dependent approximation to  $\cos(x)$ .

**Examples**

`COSD(0.0)` has the value 1.0.

`COSD(60.0)` has the value 0.5.

---

## COSH(X)

---

**Description**

Hyperbolic cosine function.

**Class**

Elemental function.

**Argument**

`x` must be of type real.

**Result Type and Type Parameter**

Same as `x`.

**Result Value**

The result has a value equal to a processor-dependent approximation to  $\cosh(x)$ .

**Examples**

`COSH(1.0)` has the value 1.5430806.

`COSH(0.1_HIGH)` has the value 1.0050041680558 with kind `HIGH`.

---

## COUNT(MASK, DIM)

---

### Optional Argument

DIM

### Description

Count the number of `.TRUE.` elements of `MASK` along dimension `DIM`.

**Class.** Transformational function.

### Argument

`MASK` must be of type logical. It must not be scalar.

`DIM` (optional) must be scalar and of type integer with a value in the range

$1 \leq \text{DIM} \leq n$ , where  $n$  is the rank of `MASK`. The corresponding actual argument must not be an optional dummy argument.

### Result Type, Type Parameter, and Shape

The result is of type default integer. It is scalar if `DIM` is absent or `MASK` has rank one; otherwise, the result is an array of rank  $n-1$  and of shape  $(d_1, d_2, \dots, d_{\text{DIM}-1}, d_{\text{DIM}+1}, \dots, d_n)$  where  $(d_1, d_2, \dots, d_n)$  is the shape of `MASK`.

**Result Value**

- Case 1            The result of `COUNT(MASK)` has a value equal to the number of `.TRUE.` elements of `MASK` or has the value zero if `MASK` has size zero.
- Case 2            If `MASK` has rank one, `COUNT(MASK, DIM)` has a value equal to that of `COUNT(MASK)`. Otherwise, the value of element  $(s_1, s_2, \dots, s_{\text{DIM}-1}, s_{\text{DIM}+1}, \dots, s_n)$  of `COUNT(MASK, DIM)` is equal to `COUNT(MASK(s1, s2, ..., sDIM-1, :, sDIM+1, ..., sn))`.

**Examples**

- Case 1            The value of `COUNT(( / .TRUE., .FALSE., .TRUE. / ))` is 2.

- Case 2            If `B` is the array

$$\begin{bmatrix} 1 & 3 & 5 \\ 2 & 4 & 6 \end{bmatrix}$$

and `C` is the array

$$\begin{bmatrix} 0 & 3 & 5 \\ 7 & 4 & 8 \end{bmatrix}$$

then `COUNT(B .NE. C, DIM = 1)` is `[2, 0, 1]`  
and `COUNT(B .NE. C, DIM = 2)` is `[1, 2]`.

---

## CPU\_TIME(TIME)

---

### Description

CPU\_TIME returns a processor dependent time in seconds. To get elapsed CPU\_TIME, you must call the intrinsic twice, once to get the start time, and again to get a finish time, and then subtract start from finish.

### Class

Subroutine

### Argument

TIME must be scalar and of type real.

As an extension Intel Fortran allows TIME to be of type REAL\*8, REAL\*16, or DOUBLE-PRECISION.

### Result Type and Type Parameter

Same as TIME.

### Example

```
PROGRAM TIMEIT
REAL STARTTIME/0.0/,STOPTIME/0.0/
A = 1.2
CALL CPU_TIME(STARTTIME)
DO I = 1,100000
    B = CCOS(CMPLX(a,0.0)) * CSIN(CMPLX(a,0.0))
ENDDO
CALL CPU_TIME(STOPTIME)
PRINT *, 'CPU TIME WAS ',STOPTIME - STARTTIME
END
```

---

## CSHIFT(ARRAY, SHIFT, DIM)

---

### Optional Argument

DIM

### Description

Perform a circular shift on an array expression of rank one, or perform circular shifts on all the complete rank one sections along a given dimension of an array expression of rank two or greater.

Elements shifted out at one end of a section are shifted in at the other end. Different sections may be shifted by different amounts and in different directions (positive for left shifts, negative for right shifts).

### Class

Transformational function.

### Arguments

ARRAY	may be of any type. It must not be scalar.
SHIFT	must be of type integer and must be scalar if ARRAY has rank one; otherwise, it must be scalar or of rank $n-1$ and of shape $(d_1, d_2, \dots, d_{\text{DIM}-1}, d_{\text{DIM}+1}, \dots, d_n)$ where $(d_1, d_2, \dots, d_n)$ is the shape of ARRAY.
DIM (optional)	must be a scalar and of type integer with a value in the range $1 \leq \text{DIM} \leq n$ , where $n$ is the rank of ARRAY. If DIM is omitted, it is as if it were present with the value 1.

### Result Type, Type Parameter, and Shape

The result is of the type and type parameters of ARRAY, and has the shape of ARRAY.

**Result Value**

- Case 1 If ARRAY has rank one, element  $i$  of the result is  
 $\text{ARRAY}(1 + \text{MODULO}(i + \text{SHIFT} - 1, \text{SIZE}(\text{ARRAY}))).$
- Case 2 If ARRAY has rank greater than one, section ( $s_1, s_2, \dots, s_{\text{DIM}-1}, :, s_{\text{DIM}+1}, \dots, s_n$ ) of the result has a value equal to  $\text{CSHIFT}(\text{ARRAY}(s_1, s_2, \dots, s_{\text{DIM}-1}, :, s_{\text{DIM}+1}, \dots, s_n), sh, 1)$ , where  $sh$  is SHIFT or  $\text{SHIFT}(s_1, s_2, \dots, s_{\text{DIM}-1}, s_{\text{DIM}+1}, \dots, s_n)$ .

**Examples**

- Case 1 If  $v$  is the array [1, 2, 3, 4, 5, 6], the effect of shifting  $v$  circularly to the left by two positions is achieved by  $\text{CSHIFT}(v, \text{SHIFT} = 2)$  which has the value [3, 4, 5, 6, 1, 2].
- $\text{CSHIFT}(v, \text{SHIFT} = -2)$  achieves a circular shift to the right by two positions and has the value [5, 6, 1, 2, 3, 4].
- Case 2 The rows of an array of rank two may all be shifted by the same amount or by different amounts. If  $M$  is the array

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

then the value of  $\text{CSHIFT}(M, \text{SHIFT} = -1, \text{DIM} = 2)$  is

$$\begin{bmatrix} 3 & 1 & 2 \\ 6 & 4 & 5 \\ 9 & 7 & 8 \end{bmatrix}$$

and the value of  $\text{CSHIFT}(M, \text{SHIFT} = (/ -1, 1, 0 /), \text{DIM} = 2)$  is

$$\begin{bmatrix} 3 & 1 & 2 \\ 5 & 6 & 4 \\ 7 & 8 & 9 \end{bmatrix}$$


---

## DATE\_AND\_TIME (DATE, TIME, ZONE, VALUES)

---

### Optional Arguments

DATE, TIME, ZONE, VALUES

### Description

Returns data on the real-time clock and date in a form compatible with the representations defined in ISO 8601:1988 (“Data elements and interchange formats — Information interchange — Representation of dates and times”).

### Class

Subroutine.

### Arguments

- |                 |  |
|-----------------|--|
| DATE (optional) | must be scalar and of type default character, and must be of length at least 8 in order to contain the complete value. It is an <code>INTENT (OUT)</code> argument. Its leftmost 8 characters are set to a value of the form <code>CCYYMMDD</code> , where <code>CC</code> is the century, <code>YY</code> the year within the century, <code>MM</code> the month within the year, and <code>DD</code> the day within the month. If there is no date available, they are set to blank. |
| TIME (optional) | must be scalar and of type default character, and must be of length at least 10 in order to contain the complete value. It is an <code>INTENT (OUT)</code> argument. Its leftmost 10 characters are set to a value of the form <code>hhmmss.sss</code> , where <code>hh</code> is the hour of the day, <code>mm</code> is the minutes of the   |

hour, and *ss.sss* is the seconds and milliseconds of the minute. If there is no clock available, they are set to blank.

ZONE (optional)	must be scalar and of type default character, and must be of length at least 5 in order to contain the complete value. It is an <code>INTENT(OUT)</code> argument. Its leftmost 5 characters are set to a value of the form $\pm hhmm$ , where <i>hh</i> and <i>mm</i> are the time difference with respect to Coordinated Universal Time (UTC) in hours and parts of an hour expressed in minutes, respectively. If there is no clock available, they are set to blank.
VALUES (optional)	must be of type default integer and of rank one. It is an <code>INTENT(OUT)</code> argument. Its size must be at least 8. The values returned in <code>VALUES</code> are as follows:
VALUES ( 1 )	the year (for example, 1990), or <code>-HUGE( 0 )</code> if there is no date available;
VALUES ( 2 )	the month of the year, or <code>-HUGE( 0 )</code> if there is no date available;
VALUES ( 3 )	the day of the month, or <code>-HUGE( 0 )</code> if there is no date available;
VALUES ( 4 )	the time difference with respect to Coordinated Universal Time (UTC) in minutes, or <code>-HUGE( 0 )</code> if this information is not available;
VALUES ( 5 )	the hour of the day, in the range of 0 to 23, or <code>-HUGE( 0 )</code> if there is no clock;
VALUES ( 6 )	the minutes of the hour, in the range 0 to 59, or <code>-HUGE( 0 )</code> if there is no clock;
VALUES ( 7 )	the seconds of the minute, in the range 0 to 60, or <code>-HUGE( 0 )</code> if there is no clock;
VALUES ( 8 )	the milliseconds of the second, in the range 0 to 999, or <code>-HUGE( 0 )</code> if there is no clock.

The `HUGE` intrinsic function is described in the section “[HUGE\(X\)](#)”.



**Example**

```
INTEGER DATE_TIME (8)
CHARACTER (LEN = 10) BIG_BEN (3)
CALL DATE_AND_TIME (BIG_BEN (1), BIG_BEN (2), &
                    BIG_BEN (3), DATE_TIME)
```

if called in Geneva, Switzerland on 1985 April 12 at 15:27:35.5 would have assigned the value "19850412bb" to `BIG_BEN(1)`, the value "152735.500" to `BIG_BEN(2)`, and the value "+0100bbbbbb" to `BIG_BEN(3)`, and the following values to `DATE_TIME`: 1985, 4, 12, 60, 15, 27, 35, 500.

Note that UTC is defined by CCIR Recommendation 460-2 (and is also known as Greenwich Mean Time).

---

## DBLE(A)

---

**Description**

Convert to double precision real type.

**Class**

Elemental function.

**Argument**

A must be of type integer, real, or complex.

**Result Type and Type Parameter**

Double precision real.

**Result Value**

Case 1                      If A is of type double precision real,  $\text{DBLE}(A) = A$ .

- |        |  |
|--------|--|
| Case 2 | If A is of type integer or real, the result is as much precision of the significant part of A as a double precision real datum can contain.          |
| Case 3 | If A is of type complex, the result is as much precision of the significant part of the real part of A as a double precision real datum can contain. |

## Examples

DBLE ( - . 3 ) is -0.3 of type double precision real.

DBLE ( 1 . 0\_HIGH / 3 ) is 0.33333333333333 of type double precision real.

---

## DFLOAT(A)

---

### Description

Convert to double precision type.

### Class

Elemental nonstandard function.

### Argument

A must be of type integer.

### Result Type and Type Parameter

Double precision.

### Example

DFLOAT ( 56 ) is 56.0 of type double precision.

---

## DIGITS(X)

---

### Description

Returns the number of significant digits in the model representing numbers of the same type and kind type parameter as the argument.

### Class

Inquiry function.

### Argument

$x$  must be of type integer or real. It may be scalar or array valued.

### Result Type, Type Parameter, and Shape

Default integer scalar.

### Result Value

The result has the value  $q$  if  $x$  is of type integer and  $p$  if  $x$  is of type real, where  $q$  and  $p$  are as defined in the section “[Data Representation Models](#)” for the model representing numbers of the same type and kind type parameter as  $x$ .

### Example

`DIGITS(X)` has the value 24 for real  $x$  whose model is described in the section “[The Real Number System Model](#)”.

---

## DIM(X, Y)

---

### Description

The difference  $X-Y$  if it is positive; otherwise zero.

### Class

Elemental function.

### Argument

X                      must be of type integer or real.

Y                      must be of the same type and kind type parameter as X.

### Result Type and Type Parameter

Same as X.

### Result Value

The value of the result is  $X-Y$  if  $X > Y$  and zero otherwise.

### Examples

DIM( 5, 3 ) has the value 2. DIM( -3.0, 2.0 ) has the value 0.0.

---

## DNUM(I)

---

### Description

Convert to double precision.

### Class

Elemental nonstandard function.

### Argument

I must be of type character.

### Result Type

Double precision.

### Examples

DNUM( "3.14159" ) is 3.14159 of type double precision.

The following code sets x to 311.0:

```
CHARACTER(3) i
DOUBLE PRECISION x
i = "311"
x = DNUM(I)
```

---

## DOT\_PRODUCT(VECTOR\_A, VECTOR\_B)

---

### Description

Performs dot-product multiplication of numeric or logical vectors.

### Class

Transformational function.

### Argument

VECTOR_A	must be of numeric type (integer, real, or complex) or of logical type. It must be array valued and of rank one.
VECTOR_B	must be of numeric type if VECTOR_A is of numeric type or of type logical if VECTOR_A is of type logical. It must be array valued and of rank one. It must be of the same size as VECTOR_A.

### Result Type, Type Parameter, and Shape

The result is scalar.

If the arguments are of numeric type, the type and kind type parameter of the result are those of the expression `VECTOR_A * VECTOR_B` determined by the types of the arguments.

If the arguments are of type logical, the result is of type logical with the kind type parameter of the expression `VECTOR_A .AND. VECTOR_B`.

**Result Value**

- Case 1            If VECTOR\_A is of type integer or real, the result has the value SUM(VECTOR\_A\*VECTOR\_B). If the vectors have size zero, the result has the value zero.
- Case 2            If VECTOR\_A is of type complex, the result has the value SUM(CONJG(VECTOR\_A)\*VECTOR\_B). If the vectors have size zero, the result has the value zero.
- Case 3            If VECTOR\_A is of type logical, the result has the value ANY(VECTOR\_A .AND. VECTOR\_B). If the vectors have size zero, the result has the value .FALSE..

**Examples**

- Case 1            DOT\_PRODUCT( (/ 1, 2, 3 /), (/ 2, 3, 4 /) ) has the value 20.
- Case 2            DOT\_PRODUCT( (/ (1.0, 2.0), (2.0, 3.0) /), (/ (1.0, 1.0), (1.0, 4.0) /) ) has the value  $17 + 4i$ .
- Case 3            DOT\_PRODUCT( (/ .TRUE., .FALSE. /), (/ .TRUE., .TRUE. /) ) has the value .TRUE..

---

**DPROD(X, Y)**

---

**Description**

Double precision real product.

**Class**

Elemental function.

**Argument**

X must be of type default real.

Y must be of type default real.

**Result Type and Type Parameters**

Double precision real.

**Result Value**

The result has a value equal to a processor-dependent approximation to the product of X and Y.

**Example**

DPROD(−3.0, 2.0) has the value −6.0 of type double precision real.

---

## DREAL(A)

---

**Description**

Convert to double precision.

**Class**

Elemental nonstandard function.

**Argument**

A must be of type integer, real, or complex.

**Result**

Double precision.



## Examples

DREAL( 91 ) is 91.0 of type double precision.

The following code sets x to 45.34:

```
COMPLEX p
DOUBLE PRECISION x
p = ( 45.34, 1.0 )
x = DREAL(p)
```

---

## DSIGN

*Returns the absolute value multiplied by  
the sign of the second argument*

---

### Description

This function performs a sign transfer by returning the absolute value of the first argument multiplied by the sign of the second argument.

### Class

Non-standard elemental function.

Prototype

### Arguments

A1	number whose absolute value is the magnitude of the result
A2	number whose sign is the sign of the result

### Result

$|A1|$  if  $A2 \geq 0$  or

$-|A1|$  if  $A2 < 0$

If A2 is zero,

if the process cannot distinguish between +0 and -0,  
the result is  $|A1|$   
otherwise, for -0, the value is  $-|A1|$   
for +0, the value is  $|A1|$

---

## EOSHIFT(ARRAY, SHIFT, BOUNDARY, DIM)

---

### Optional Argument

BOUNDARY, DIM

### Description

Perform an end-off shift on an array expression of rank one or perform end-off shifts on all the complete rank-one sections along a given dimension of an array expression of rank two or greater.

Elements are shifted off at one end of a section and copies of a boundary value are shifted in at the other end.

Different sections may have different boundary values and may be shifted by different amounts and in different directions (positive for left shifts, negative for right shifts).

### Class

Transformational function.

### Argument

ARRAY	may be of any type. It must not be scalar.
SHIFT	must be of type integer and must be scalar if ARRAY has rank one; otherwise, it must be scalar or of rank n-1 and of shape $(d_1, d_2, \dots, d_{\text{DIM}-1}, d_{\text{DIM}+1}, \dots, d_n)$ where $(d_1, d_2, \dots, d_n)$ is the shape of ARRAY.

BOUNDARY (optional) must be of the same type and type parameters as ARRAY and must be scalar if ARRAY has rank one; otherwise, it must be either scalar or of rank  $n-1$  and of shape  $(d_1, d_2, \dots, d_{\text{DIM}-1}, d_{\text{DIM}+1}, \dots, d_n)$ . BOUNDARY may be omitted for the data types in the following table and, in this case, it is as if it were present with the scalar value shown.

Type of ARRAY	Value of BOUNDARY
Integer	0
Real	0.0
Complex	(0.0, 0.0)
Logical	.FALSE.
Character ( <i>len</i> )	<i>len</i> blanks

DIM (optional) must be scalar and of type integer with a value in the range  $1 \leq \text{DIM} \leq n$ , where  $n$  is the rank of ARRAY. If DIM is omitted, it is as if it were present with the value 1.

### Result Type, Type Parameter, and Shape

The result has the type, type parameters, and shape of ARRAY.

### Result Value

Element  $(s_1, s_1, \dots, s_n)$  of the result has the value  $\text{ARRAY}(s_1, s_2, \dots, s_{\text{DIM}-1}, s_{\text{DIM}} + sh, s_{\text{DIM}+1}, \dots, s_n)$  where  $sh$  is SHIFT or  $\text{SHIFT}(s_1, s_2, \dots, s_{\text{DIM}-1}, s_{\text{DIM}+1}, \dots, s_n)$  provided the inequality  $\text{LBOUND}(\text{ARRAY}, \text{DIM}) \leq s_{\text{DIM}} + sh \leq \text{UBOUND}(\text{ARRAY}, \text{DIM})$  holds and is otherwise BOUNDARY or  $\text{BOUNDARY}(s_1, s_2, \dots, s_{\text{DIM}-1}, s_{\text{DIM}+1}, \dots, s_n)$ .

### Examples

Case 1 If  $v$  is the array [1, 2, 3, 4, 5, 6], the effect of shifting  $v$  end-off to the left by 3 positions is achieved by  $\text{EOSHIFT}(v, \text{SHIFT} = 3)$  which has the value [4, 5, 6, 0, 0, 0].

`EOSHIFT(V, SHIFT = -2, BOUNDARY = 99)` achieves an end-off shift to the right by 2 positions with the boundary value of 99 and has the value [99, 99, 1, 2, 3, 4].

## Case 2

The rows of an array of rank two may all be shifted by the same amount or by different amounts and the boundary elements can be the same or different. If `M` is the array

$$\begin{bmatrix} A & B & C \\ D & E & F \\ G & H & I \end{bmatrix}$$

then the value of `EOSHIFT(M, SHIFT = -1, BOUNDARY = '*' , DIM = 2)` is

$$\begin{bmatrix} * & A & B \\ * & D & E \\ * & G & H \end{bmatrix}$$

and the value of `EOSHIFT(M, SHIFT = (/ -1, 1, 0 /), BOUNDARY = (/ '*' , '/' , '?' /), DIM = 2)` is

$$\begin{bmatrix} * & A & B \\ E & F & / \\ G & H & I \end{bmatrix}$$


---

## EPSILON(X)

---

### Description

Returns a positive model number that is almost negligible compared to unity in the model representing numbers of the same type and kind type parameter as the argument.

**Class**

Inquiry function.

**Argument**

$x$  must be of type real. It may be scalar or array valued.

**Result Type, Type Parameter, and Shape**

Scalar of the same type and kind type parameter as  $x$ .

**Result Value**

The result has the value  $b^{1-p}$  where  $b$  and  $p$  are as defined in the section “[The Real Number System Model](#)” for the model representing numbers of the same type and kind type parameter as  $x$ .

**Examples**

`EPSILON(X)` has the value  $2^{-23}$  for real  $x$  whose model is described in the section “[The Real Number System Model](#)”.

`EPSILON(Y)`, where  $Y$  has kind parameter `HIGH`, would be  $2^{-52}$  if  $p$  is 48 for the model of kind `HIGH`.

---

## EXP(X)

---

**Description**

Exponential.

**Class**

Elemental function.

**Argument**

$x$  must be of type real or complex.

**Result Type and Type Parameter**

Same as `x`.

**Result Value**

The result has a value equal to a processor-dependent approximation to  $e^x$ . If `x` is of type complex, its imaginary part is regarded as a value in radians.

**Examples**

`EXP(1.0)` has the value 2.7182818.

`EXP(2.0_HIGH/3.0)` has the value 1.9477340410547 with kind `HIGH`.

---

## EXPONENT(X)

---

**Description**

Returns the exponent part of the argument when represented as a model number.

**Class**

Elemental function.

**Argument**

`x` must be of type real.

**Result Type**

Default integer.

**Result Value**

The result has a value equal to the exponent  $e$  of the model representation (see the section “[The Real Number System Model](#)”) for the value of  $x$ , provided  $x$  is nonzero and  $e$  is within the range for default integers. The result is undefined if the processor cannot represent  $e$  in the default integer type. `EXPONENT(x)` has the value zero if  $x$  is zero.

**Examples**

`EXPONENT(1.0)` has the value 1 and `EXPONENT(4.1)` has the value 3 for reals, whose model is described in the section “[The Real Number System Model](#)”.

---

## FLOOR(A)

---

**Description**

Returns the greatest integer less than or equal to its argument.

**Class**

Elemental function.

**Argument**

A must be of type real.

**Result Type and Type Parameter**

Default integer.

**Result Value**

The result has a value equal to the greatest integer less than or equal to A. The result is undefined if the processor cannot represent this value in the default integer type.

**Examples**

FLOOR( 3 . 7 ) has the value 3.

FLOOR( -3 . 7 ) has the value -4.

FLOOR( 10 . 0\_HIGH/3 ) has the value 3.

---

## FRACTION(X)

---

**Description**

Returns the fractional part of the model representation of the argument value.

**Class**

Elemental function.

**Argument**

x must be of type real.

**Result Type and Type Parameter**

Same as x.

**Result Value**

The result has the value  $x \times b^{-e}$ , where  $b$  and  $e$  are as defined in the section “[The Real Number System Model](#)”. If x has the value zero, the result has the value zero.

**Example**

FRACTION( 3 . 0 ) has the value 0.75 for reals, whose model is described in “[The Real Number System Model](#)”.



---

## FREE(A)

---

### Description

Frees a block of memory that is currently allocated.

### Class

Elemental nonstandard subroutine.

### Argument

A must be of type `INTEGER(4)` for IA-32 systems or `INTEGER(8)` for Itanium™-based systems. This value is the starting address of the memory to be freed, previously allocated by `MALLOC`.

If the freed address was not previously allocated by `MALLOC(I)`, or if an address is freed more than once, results are unpredictable.

### Example

```
INTEGER(4) ADDR, SIZE.  
SIZE = 1024           ! Size in bytes  
ADDR = MALLOC(SIZE)   ! Allocate the memory  
CALL FREE(ADDR)       ! Free it  
END
```

---

## HFIX(A)

---

### Description

Convert to `INTEGER(2)` type.

### Class

Elemental nonstandard function.

### Argument

A must be of type integer, real, double precision, or complex.

### Result

`INTEGER(2)` type.

### Examples

`HFIX(9.897)` is 9 of type `INTEGER(2)`.

`HFIX(9.125)` is 9 of type `INTEGER(2)`.

The following code sets b to 34:

```
INTEGER(2) b
COMPLEX p
p = (34.5, 1.0)
b = HFIX(p)
```

---

## HUGE(X)

---

### Description

Returns the largest number in the model representing numbers of the same type and kind type parameter as the argument.

### Class

Inquiry function.

### Argument

x must be of type integer or real. It may be scalar or array valued.

**Result Type, Type Parameter, and Shape.** Scalar of the same type and kind type parameter as x.

### Result Value

The result has the value  $r^q - 1$  if x is of type integer and

$$(1 \div b^{\text{DP}})b^{e_{\max}}$$

if x is of type real, where  $r$ ,  $q$ ,  $b$ ,  $p$ , and  $e_{\max}$  are as defined in the section “[The Real Number System Model](#)”.

### Example

HUGE (x) has the value  $(1 - 2^{-24}) \times 2^{127}$  for real x, whose model is described in “[The Real Number System Model](#)”.

---

## IABS(A)

*Returns the absolute value of an integer expression*

---

### Description

IABS returns the absolute value of an INTEGER\*2 expression.

### Class

Elemental function.

### Argument

A must be of type INTEGER\*2 value or expression.

### Result Value

If A is positive or zero, the value of A is returned. If A is less than zero, the opposite positive value of A is returned.

### Output

Absolute value of A.

---

## IACHAR(C)

---

### Description

Returns the position of a character in the ASCII collating sequence.

**Class**

Elemental function.

**Argument**

C must be of type default character and of length one.

**Result Type and Type Parameter**

Default integer.

**Result Value**

If C is in the collating sequence defined by the codes specified in ISO 646:1983 (“Information technology — ISO 7-bit coded character set for information interchange”), the result is the position of C in that sequence and satisfies the inequality  $(0 \leq \text{IACHAR}(C) \leq 127)$ .

A processor-dependent value is returned if C is not in the ASCII collating sequence. The results are consistent with the LGE, LGT, LLE, and LLT lexical comparison functions. For example, if `LLE(C, D)` is `.TRUE.`, `IACHAR(C) .LE. IACHAR(D)` is `.TRUE.` where C and D are any two characters representable by the processor.

**Examples**

`IACHAR('X')` has the value 88.

`IACHAR('*')` has the value 42.

---

## IADDR(X)

---

**Description**

Return the address of x.

**Class**

Inquiry nonstandard function.

**Argument**

x may be of any type.

**Result Type.** The result is of type default integer.

See the section “[BADDRESS\(X\)](#)” for examples.

---

## IAND(I, J)

---

**Description**

Performs a bitwise logical AND.

**Class**

Elemental function.

**Argument**

I                      must be of type integer.

J                      must be of type integer with the same kind type  
parameter as I.

**Result Type and Type Parameter**

Same as I.

**Result Value**

The result has the value obtained by combining `I` and `J` bit-by-bit according to the following truth table:

<code>I</code>	<code>J</code>	<code>IAND(I, J)</code>
1	1	1
1	0	0
0	1	0
0	0	0

The model for the interpretation of an integer value as a sequence of bits is in “[The Bit Model](#)”.

**Examples**

`IAND(1, 3)` has the value 1.

`IAND(2_SHORT, 10_SHORT)` is 2 with kind `SHORT`.

---

**IBCLR(I, POS)**

---

**Description**

Clears a bit to zero.

**Class**

Elemental function.

**Argument**

`I` must be of type integer.

`POS` must be of type integer. It must be nonnegative and less than `BIT_SIZE(I)`.

**Result Type and Type Parameter**

Same as `I`.

**Result Value**

The result has the value of the sequence of bits of `I`, except that bit `POS` of `I` is set to zero. The model for the interpretation of an integer value as a sequence of bits is in “[The Bit Model](#)”.

**Examples**

`IBCLR(14, 1)` has the result 12.

If `V` has the value (1, 2, 3, 4), the value of `IBCLR(POS = V, I = 31)` is [29, 27, 23, 15].

The value of `IBCLR(( / 15_SHORT, 31_SHORT, 7_SHORT / ), 3)` is [7, 23, 7] with kind `SHORT`.

---

**IBITS(I, POS, LEN)**

---

**Description**

Extracts a sequence of bits.

**Class**

Elemental function.

**Argument**

<code>I</code>	must be of type integer.
<code>POS</code>	must be of type integer. It must be nonnegative and <code>POS + LEN</code> must be less than or equal to <code>BIT_SIZE(I)</code> .
<code>LEN</code>	must be of type integer and nonnegative.



**Result Type and Type Parameter**

Same as `I`.

**Result Value**

The result has the value of the sequence of `LEN` bits in `I` beginning at bit `POS`, right-adjusted and with all other bits zero. The model for the interpretation of an integer value as a sequence of bits is in the section “[The Bit Model](#)”.

**Examples**

`IBITS(14, 1, 3)` has the value 7.

The value of `IBITS(( / 15_SHORT, 31_SHORT, 7_SHORT / ), 2_SHORT, 3_SHORT)` is [3, 7, 1] with kind `SHORT`.

---

**IBSET(I, POS)**

---

**Description**

Sets a bit to one.

**Class**

Elemental function.

**Argument**

<code>I</code>	must be of type integer.
<code>POS</code>	must be of type integer. It must be nonnegative and less than <code>BIT_SIZE(I)</code> .

**Result Type and Type Parameter**

Same as `I`.

**Result Value**

The result has the value of the sequence of bits of `I`, except that bit `POS` of `I` is set to one. The model for the interpretation of an integer value as a sequence of bits is in the section “[The Bit Model](#)”.

**Examples**

`IBSET(12, 1)` has the value 14.

If `V` has the value [1, 2, 3, 4], the value of `IBSET(POS = V, I = 0)` is [2, 4, 8, 16].

The value of `IBSET(( / 15_SHORT, 31_SHORT, 7_SHORT / ), 3)` is [15, 31, 15] with kind `SHORT`.

---

**ICHAR(C)**

---

**Description**

Returns the position of a character in the processor collating sequence associated with the kind type parameter of the character.

**Class**

Elemental function.

**Argument**

`C` must be of type character and of length one. Its value must be that of a character capable of representation in the processor.

**Result Type and Type Parameter**

Default integer.

### Result Value

The result is the position of `C` in the processor collating sequence associated with the kind type parameter of `C` and is in the range  $0 \leq \text{IACHAR}(C) \leq n-1$ , where  $n$  is the number of characters in the collating sequence.

For any characters `C` and `D` capable of representation in the processor, `C.LE.D` is `.TRUE.` if and only if `ICHAR(C) .LE. ICHAR(D)` is `.TRUE.`, and `C.EQ.D` is `.TRUE.` if and only if `ICHAR(C).EQ. ICHAR(D)` is `.TRUE.`.

### Examples

`ICHAR('X')` has the value 88 on a processor using the ASCII collating sequence for the default character type.

`ICHAR('*')` has the value 42 on such a processor.

---

## IDIM(X, Y)

---

### Description

Integer positive difference.

### Class

Nonstandard function.

### Argument

<code>X</code>	must be of type integer.
<code>Y</code>	must be of type integer with the same kind type parameter as <code>X</code> .

### Result Type and Type Parameter

Integer of same kind type parameter as `X`.

**Result Value**

If  $X > Y$ , `IDIM(X, Y)` is  $X - Y$ . If  $X \leq Y$ , `IDIM(X, Y)` is zero.

**Examples**

`IDIM(89, 12)` is 77.

`IDIM(56, 59)` is 0.

---

**IEOR(I, J)**

---

**Description**

Performs a bitwise exclusive OR.

**Class**

Elemental function.

**Argument**

`I` must be of type integer.

`J` must be of type integer with the same kind type parameter as `I`.

**Result Type and Type Parameter**

Same as `I`.

**Result Value**

The result has the value obtained by combining `I` and `J` bit-by-bit according to the following truth table:

<code>I</code>	<code>J</code>	<code>IEOR(I, J)</code>
1	1	0
1	0	1
0	1	1
0	0	0

The model for the interpretation of an integer value as a sequence of bits is in the section “[The Bit Model](#)”.

**Examples**

`IEOR(1, 3)` has the value 2.  
`IEOR( (/ 3_SHORT, 10_SHORT /), 2_SHORT)` is `[1, 8]` with kind `SHORT`.

---

**IJINT(A)**

---

**Description**

Convert to `INTEGER(2)` type.

**Class**

Elemental nonstandard function.

**Argument**

`A` must be of type `INTEGER(4)`.

## Result

INTEGER( 2 ) type.

## Example

IJINT( 32 ) is 32 of type INTEGER( 2 ).

---

# IMAG(A)

---

## Description

Imaginary part of complex number.

## Class

Elemental nonstandard function.

## Argument

A must be of type complex or double complex.

## Result

Real if A is complex. Double precision if A is double complex.

## Example

The following code sets x to 2.0:

```
COMPLEX p
REAL x
p = ( 39.61, 2.0 )
x = IMAG(p)
```

---

# INDEX(STRING, SUBSTRING, BACK)

---

**Optional Argument**

BACK

**Description**

Returns the starting position of a substring within a string.

**Class**

Elemental function.

**Argument**

- STRING            must be of type character.
- SUBSTRING        must be of type character with the same kind type  
                     parameter as STRING
- BACK (optional)   must be of type logical.

**Result Type and Type Parameter**

Default integer.

**Result Value**

- Case 1            If BACK is absent or present with the value `.FALSE.`, the  
                     result is the minimum positive value of `I` such that  
                     `STRING(I : I + LEN(SUBSTRING) - 1) =`  
                     `SUBSTRING` or zero if there is no such value.  
  
                     Zero is returned if `LEN(STRING) < LEN(SUBSTRING)`  
                     and one is returned if `LEN(SUBSTRING) = 0`.

**Case 2**

If BACK is present with the value `.TRUE.`, the result is the maximum value of `I` less than or equal to `LEN(STRING) - LEN(SUBSTRING) + 1` such that `STRING(I : I + LEN(SUBSTRING) - 1) = SUBSTRING` or zero if there is no such value.

Zero is returned if `LEN(STRING) < LEN(SUBSTRING)` and `LEN(STRING) + 1` is returned if `LEN(SUBSTRING) = 0`.

**Examples**

`INDEX( 'FORTRAN', 'R' )` has the value 3.

`INDEX( 'FORTRAN', 'R', BACK = .TRUE. )` has the value 5.

`INDEX( "XXX", " " )` has the value 1.

`INDEX( "XXX", " ", BACK=.TRUE. )` has the value 4.

---

**INT(A, KIND)**

---

**Optional Argument**

KIND

**Description**

Convert to integer type.

**Class**

Elemental function.

**Argument**

A must be of type integer, real, or complex.

KIND (optional) must be a scalar integer initialization expression.



## Result Type and Type Parameter

Integer. If `KIND` is present, the kind type parameter is that specified by `KIND`; otherwise, the kind type parameter is that of default integer type.

## Result Value

- Case 1            If `A` is of type integer, `INT(A) = A`.
- Case 2            If `A` is of type real, there are two cases: if  $|A| < 1$ , `INT(A)` has the value 0; if  $|A| \geq 1$ , `INT(A)` is the integer whose magnitude is the largest integer that does not exceed the magnitude of `A` and whose sign is the same as the sign of `A`.
- Case 3            If `A` is of type complex, `INT(A)` is the value obtained by applying the above rules (for reals) to the real part of `A`. The result is undefined if the processor cannot represent the result in the specified integer type.

## Examples

`INT(-3.7)` has the value `-3`.

`INT(9.1_HIGH/4.0_HIGH, SHORT)` is 2 with kind `SHORT`.

---

# INT1(A)

---

## Description

Convert to `INTEGER(1)` type.

## Class

Elemental nonstandard function.

**Argument**

A must be of type integer, real, or complex.

**Result**

`INTEGER(1)` type. If A is complex, `INT1(A)` is equal to the truncated real portion of A.

**Example**

`INT1(6.23)` is 6 of type `INTEGER(1)`.

---

## **INT2(A)**

---

**Description**

Convert to `INTEGER(2)` type.

**Class**

Elemental nonstandard function.

**Argument**

A must be of type integer, real, or complex.

**Result**

`INTEGER(2)` type. If A is complex, `INT2(A)` is equal to the truncated real portion of A.

**Example**

`INT2(212.4545)` is 212 of type `INTEGER(2)`.

---

## INT4(A)

---

### Description

Convert to `INTEGER( 4 )` type.

### Class

Elemental nonstandard function.

### Argument

A must be of type integer, real, or complex.

### Result

`INTEGER( 4 )` type. If A is complex, `INT4( A )` is equal to the truncated real portion of A.

### Example

`INT4( 1988.74 )` is 1988 of type `INTEGER( 4 )`.

---

## INT8(A)

---

### Description

Convert to `INTEGER( 8 )` type.

### Class

Elemental nonstandard function.

**Argument**

A must be of type integer, real, or complex.

**Result**

INTEGER( 8 ) type. If A is complex, INT8( A ) is equal to the truncated real portion of A.

**Example**

INT8( 14.14 ) is 14 of type INTEGER( 8 ).

---

## INUM(I)

---

**Description**

Convert character to INTEGER( 2 ) type.

**Class**

Elemental nonstandard function.

**Argument**

I must be of type character.

**Result**

INTEGER( 2 ) type.

**Example**

INUM( "451.92" ) is 451 of type INTEGER( 2 ).

---

## IOR(I, J)

---

### Description

Performs a bitwise inclusive OR.

### Class

Elemental function.

### Argument

$I$  must be of type integer.

$J$  must be of type integer with the same kind type parameter as  $I$ .

### Result Type and Type Parameter

Same as  $I$ .

### Result Value

The result has the value obtained by combining  $I$  and  $J$  bit-by-bit according to the following truth table:

$I$	$J$	$IOR(I, J)$
1	1	1
1	0	1
0	1	1
0	0	0

The model for the interpretation of an integer value as a sequence of bits is in the section “[The Bit Model](#)”.

---

## IQINT(A)

---

### Description

Convert to integer type.

### Class

Elemental nonstandard function.

### Argument

A must be of type `REAL(16)`.

### Result

Integer type.

### Examples

`IQINT(9416.39)` is 9416.

---

## ISHFT(I, SHIFT)

---

### Description

Performs a logical shift.

### Class

Elemental function.

**Argument**

`I` must be of type integer.

`SHIFT` must be of type integer. The absolute value of `SHIFT` must be less than or equal to `BIT_SIZE(I)`.

**Result Type and Type Parameter**

Same as `I`.

**Result Value**

The result has the value obtained by shifting the bits of `I` by `SHIFT` positions.

If `SHIFT` is positive, the shift is to the left; if `SHIFT` is negative, the shift is to the right; and if `SHIFT` is zero, no shift is performed. Bits shifted out from the left or from the right, as appropriate, are lost. Zeros are shifted in from the opposite end.

The model for the interpretation of an integer value as a sequence of bits is in the section “[The Bit Model](#)”.

**Examples**

`ISHFT(3, 1)` has the value 6.

`ISHFT(3, -1)` has the value 1.

---

**ISHFTC(I, SHIFT, SIZE)**

---

**Optional Argument**

`SIZE`

**Description**

Performs a circular shift of the rightmost bits.

**Class**

Elemental function.

**Argument**

<code>I</code>	must be of type integer.
<code>SHIFT</code>	must be of type integer. The absolute value of <code>SHIFT</code> must be less than or equal to <code>SIZE</code> .
<code>SIZE</code> (optional)	must be of type integer. The value of <code>SIZE</code> must be positive and must not exceed <code>BIT_SIZE(I)</code> . If <code>SIZE</code> is absent, it is as if it were present with the value of <code>BIT_SIZE(I)</code> .

**Result Type and Type Parameter**

Same as `I`.

**Result Value**

The result has the value obtained by shifting the `SIZE` rightmost bits of `I` circularly by `SHIFT` positions.

If `SHIFT` is positive, the shift is to the left; if `SHIFT` is negative, the shift is to the right; and if `SHIFT` is zero, no shift is performed. No bits are lost. The unshifted bits are unaltered.

The model for the interpretation of an integer value as a sequence of bits is in the section “[The Bit Model](#)”.

**Example**

`ISHFTC(3, 2, 3)` has the value 5.



---

## ISIGN(A, B)

---

### Description

Absolute value of A times the sign of B.

### Class

Elemental nonstandard function.

### Argument

A                    must be of type integer.

B                    must be of type integer with the same kind type  
                      parameter as A.

### Result Type and Type Parameter

Same as A.

### Result Value

The value of the result is  $|A|$  if  $B \geq 0$  and  $-|A|$  if  $B < 0$ .

### Examples

ISIGN(-3, 0) is 3.

ISIGN(12, -9) is -12.

---

## ISNAN(X)

---

### Description

Determine if a value is NaN (not a number).

### Class

Elemental nonstandard function.

### Argument

x must be of type real.

### Result Type

Logical.

### Examples

```
ISNAN(45.4) is .FALSE..  
ISNAN(ACOSH(0.0)) is .TRUE..
```

---

## IXOR(I, J)

---

### Description

Exclusive OR.

### Class

Elemental nonstandard function.

**Argument**

- I                    must be of type integer.
- J                    must be of type integer with the same kind type  
                         parameter as I.

**Result Type and Type Parameter**

Same as I.

**Result Value**

The result has the value obtained by performing an exclusive OR on I and J bit-by-bit according to the truth table that follows.

I	J	IXOR( I , J )
1	1	0
1	0	1
0	1	1
0	0	0

The model for interpreting an integer value as a sequence of bits is in the section “[The Bit Model](#)”.

**Example**

IXOR( 12 , 7 ) is 11. (Binary 1100 exclusive OR with binary 0111 is binary 1011.)

---

## JNUM(I)

---

### Description

Convert character to integer type.

### Class

Elemental nonstandard function.

### Argument

I must be of type character.

### Result

Integer type.

### Example

JNUM( "46616.725" ) is 46616.

---

## KIND(X)

---

### Description

Returns the value of the kind type parameter of x.

### Class

Inquiry function.

**Argument**

x may be of any intrinsic type.

**Result Type, Type Parameter, and Shape**

Default integer scalar.

**Result Value**

The result has a value equal to the kind type parameter value of x.

**Examples**

`KIND(0.0)` has the kind type parameter value of default real.

`KIND(1.0_HIGH)` has the value of the named constant `HIGH`.

---

## LBOUND(ARRAY, DIM)

---

**Optional Argument**

DIM

**Description**

Returns all the lower bounds or a specified lower bound of an array.

**Class**

Inquiry function.

**Argument**

ARRAY                      may be of any type. It must not be scalar. It must not be a pointer that is disassociated or an allocatable array that is not allocated.

`DIM` (optional) must be scalar and of type integer with a value in the range  $1 \leq \text{DIM} \leq n$ , where  $n$  is the rank of `ARRAY`. The corresponding actual argument must not be an optional dummy argument.

### Result Type, Type Parameter, and Shape

The result is of type default integer. It is scalar if `DIM` is present; otherwise, the result is an array of rank one and size  $n$ , where  $n$  is the rank of `ARRAY`.

### Result Value

Case 1 For an array section or for an array expression other than a whole array or array structure component, `LBOUND(ARRAY, DIM)` has the value 1. For a whole array or array structure component, `LBOUND(ARRAY, DIM)` has the value:

- equal to the lower bound for subscript `DIM` of `ARRAY` if dimension `DIM` of `ARRAY` does not have extent zero or if `ARRAY` is an assumed-size array of rank `DIM`

or

- one (1), otherwise.

Case 2 `LBOUND(ARRAY)` has a value whose  $i$ th component is equal to `LBOUND(ARRAY, i)`, for  $i = 1, 2, \dots, n$ , where  $n$  is the rank of `ARRAY`.

### Examples

If the following statements are processed

```
REAL, TARGET :: A (2:3, 7:10)
REAL, POINTER, DIMENSION (:,:) :: B, C, D
B => A
C => A(:, :)
ALLOCATE ( D(-3:3, -7:7) )
LBOUND(A) is [2, 7], LBOUND(A, DIM=2) is 7, LBOUND(B)
is [2, 7], LBOUND(C) is [1, 1], and LBOUND(D) is
[-3, -7].
```

---

## LEN(String)

---

### Description

Returns the length of a character entity.

### Class

Inquiry function.

### Argument

String must be of type character. It may be scalar or array valued.

### Result Type, Type Parameter, and Shape

Default integer scalar.

### Result Value

The result has a value equal to the number of characters in String if it is scalar or in an element of String if it is array valued.

### Example

If C and D are declared by the statements

```
CHARACTER (11) C(100)
```

```
CHARACTER (LEN=31) D
```

LEN(C) has the value 11, and LEN(D) has the value 31.

---

## LEN\_TRIM(String)

---

### Description

Returns the length of the character argument without counting trailing blank characters.

### Class

Elemental function.

### Argument

String must be of type character.

### Result Type and Type Parameter

Default integer.

### Result Value

The result has a value equal to the number of characters remaining after any trailing blanks in String are removed. If the argument contains no nonblank characters, the result is zero.

### Examples

LEN\_TRIM( 'babbb' ) has the value 4.

LEN\_TRIM( 'bbb' ) has the value 0.



---

## LGE(String\_A, String\_B)

---

### Description

Tests whether a string is lexically greater than or equal to another string, based on the ASCII collating sequence.

### Class

Elemental function.

### Argument

String\_A            must be of type default character.

String\_B            must be of type default character.

### Result Type and Type Parameters

Default logical.

### Result Value

If the strings are of unequal length, the comparison is made as if the shorter string were extended on the right with blanks to the length of the longer string.

If either string contains a character not in the ASCII character set, the result is processor dependent.

The result is `.TRUE.` if the strings are equal or if String\_A follows String\_B in the ASCII collating sequence; otherwise, the result is `.FALSE.` Note that the result is `.TRUE.` if both String\_A and String\_B are of zero length.

### Examples

`LGE('apple', 'beans')` has the value `.FALSE.`

`LGE('apple', 'applesauce')` has the value `.FALSE.`

`LGE('Zebra', 'Yak')` has the value `.TRUE.`

---

## LGT(String\_A, String\_B)

---

### Description

Tests whether a string is lexically greater than another string, based on the ASCII collating sequence.

### Class

Elemental function.

### Argument

String\_A            must be of type default character.

String\_B            must be of type default character.

### Result Type and Type Parameters

Default logical.

### Result Value

If the strings are of unequal length, the comparison is made as if the shorter string were extended on the right with blanks to the length of the longer string.

If either string contains a character not in the ASCII character set, the result is processor-dependent.

The result is `.TRUE.` if String\_A follows String\_B in the ASCII collating sequence; otherwise, the result is `.FALSE.`. Note that the result is `.FALSE.` if both String\_A and String\_B are of zero length.

### Examples

`LGT('apple', 'beans')` has the value `.FALSE.`

`LGT('apple', 'applesauce')` has the value `.FALSE.`

`LGT('Zebra', 'Yak')` has the value `.TRUE.`

---

## LLE(String\_A, String\_B)

---

### Description

Tests whether a string is lexically less than or equal to another string, based on the ASCII collating sequence.

### Class

Elemental function.

### Argument

String\_A            must be of type default character.

String\_B            must be of type default character.

### Result Type and Type Parameters

Default logical.

### Result Value

If the strings are of unequal length, the comparison is made as if the shorter string were extended on the right with blanks to the length of the longer string.

If either string contains a character not in the ASCII character set, the result is processor dependent.

The result is `.TRUE.` if the strings are equal or if String\_A precedes String\_B in the ASCII collating sequence; otherwise, the result is `.FALSE.` Note that the result is `.TRUE.` if both String\_A and String\_B are of zero length.

### Examples

`LLE('apple', 'beans')` has the value `.TRUE.`

`LLE('apple', 'applesauce')` has the value `.TRUE.`

`LLE('Zebra', 'Yak')` has the value `.FALSE.`

---

## LLT(String\_A, String\_B)

---

### Description

Tests whether a string is lexically less than another string, based on the ASCII collating sequence.

### Class

Elemental function.

### Argument

String\_A            must be of type default character.

String\_B            must be of type default character.

### Result Type and Type Parameters

Default logical.

### Result Value

If the strings are of unequal length, the comparison is made as if the shorter string were extended on the right with blanks to the length of the longer string.

If either string contains a character not in the ASCII character set, the result is processor-dependent.

The result is `.TRUE.` if String\_A precedes String\_B in the ASCII collating sequence; otherwise, the result is `.FALSE.`. Note that the result is `.FALSE.` if both String\_A and String\_B are of zero length.

### Examples

`LLT('apple', 'beans')` has the value `.TRUE.`.

`LLT('apple', 'applesauce')` has the value `.TRUE.`.

`LLT('Zebra', 'Yak')` has the value `.FALSE.`.

---

## LOC(X)

---

### Description

Return the address of the argument.

### Class

Inquiry nonstandard function.

For details see [“LOC” on page 85](#).

---

## LOG(X)

---

### Description

Natural logarithm.

### Class

Elemental function.

### Argument

x must be of type real or complex. If x is real, its value must be greater than zero. If x is complex, its value must not be zero.

### Result Type and Type Parameter

Same as x.

**Result Value**

The result has a value equal to a processor-dependent approximation to  $\log_e x$ . A result of type complex is the principal value with imaginary part  $\omega$  in the range  $-\pi < \omega \leq \pi$ . The imaginary part of the result is  $\pi$  only when the real part of the argument is less than zero and the imaginary part of the argument is zero.

**Examples**

`LOG(10.0)` has the value 2.3025851.

`LOG(-0.5_HIGH, 0)` has the value:

`-0.69314718055994 + 3.1415926535898i` with kind `HIGH`.

---

**LOG10(X)**

---

**Description**

Common logarithm.

**Class**

Elemental function.

**Argument**

x must be of type real. The value of x must be greater than zero.

**Result Type and Type Parameter**

Same as x.

**Result Value**

The result has a value equal to a processor-dependent approximation to  $\log_{10}X$ .

**Examples**

`LOG10(10.0)` has the value 1.0.

`LOG10(10.0E1000_HIGH)` has the value 1001.0 with kind `HIGH`.

---

## LOGICAL(L, KIND)

---

**Optional Argument**

`KIND`

**Description**

Converts between kinds of logical.

**Class**

Elemental function.

**Argument**

`L` must be of type logical.

`KIND` (optional) must be a scalar integer initialization expression.

**Result Type and Type Parameter**

Logical. If `KIND` is present, the kind type parameter is that specified by `KIND`; otherwise, the kind type parameter is that of default logical.

**Result Value**

The value is that of `L`.

**Examples**

LOGICAL(L .OR. .NOT. L) has the value .TRUE. and is of type default logical, regardless of the kind type parameter of the logical variable L.

LOGICAL(L, BIT) has kind parameter BIT and has the same value as L.

---

**LSHFT(I, SHIFT)**

---

**Description**

Left shift.

**Class**

Elemental nonstandard function.

For details see [“LSHFT” on page 89](#).

---

**LSHIFT(I, SHIFT)**

---

**Description**

Left shift.

**Class**

Elemental nonstandard function.

For details see [“LSHIFT” on page 90](#).



---

## MALLOC (I)

---

### Description

Allocates a block of memory. This nonstandard function has no generic function associated with it. It must not be passed as an actual argument.

### Class

Elemental nonstandard function.

### Argument

I must be of type `INTEGER( 4 )`. This value is the size (in bytes) of memory to be allocated.

### Result

The result type is `INTEGER( 4 )` for IA-32 systems or `INTEGER( 8 )` for Itanium™-based systems. The result is the starting address of the allocated memory. The memory allocated can be freed by using the [`FREE\(A\)`](#) intrinsic function.

### Example

```
INTEGER(4) ADDR, SIZE.  
SIZE = 1024           ! Size in bytes  
ADDR = MALLOC(SIZE)   ! Allocate the memory  
CALL FREE(ADDR)       ! Free it  
END
```

---

## MATMUL(MATRIX\_A, MATRIX\_B)

---

### Description

Performs matrix multiplication of numeric or logical matrices.

### Class

Transformational function.

### Argument

**MATRIX\_A** must be of numeric type (integer, real, or complex) or of logical type. It must be array valued and of rank one or two.

**MATRIX\_B** must be of numeric type if **MATRIX\_A** is of numeric type and of logical type if **MATRIX\_A** is of logical type. It must be array valued and of rank one or two.

If **MATRIX\_A** has rank one, **MATRIX\_B** must have rank two. If **MATRIX\_B** has rank one, **MATRIX\_A** must have rank two. The size of the first (or only) dimension of **MATRIX\_B** must equal the size of the last (or only) dimension of **MATRIX\_A**.

### Result Type, Type Parameter, and Shape

If the arguments are of numeric type, the type and kind type parameter of the result are determined by the types of **MATRIX\_A** and **MATRIX\_B**.

If the arguments are of type logical, the result is of type logical with the kind type parameter of the arguments.

The shape of the result depends on the shapes of the arguments as follows:

- |        |  |
|--------|--|
| Case 1 | If <b>MATRIX_A</b> has shape $[n, m]$ and <b>MATRIX_B</b> has shape $[m, k]$ , the result has shape $[n, k]$ . |
| Case 2 | If <b>MATRIX_A</b> has shape $[m]$ and <b>MATRIX_B</b> has shape $[m, k]$ , the result has shape $[k]$ .       |

Case 3 If `MATRIX_A` has shape  $[n, m]$  and `MATRIX_B` has shape  $[m]$ , the result has shape  $[n]$ .

### Result Value

Case 1 Element  $(i, j)$  of the result has the value  
`SUM(MATRIX_A( $i, :$ ) * MATRIX_B( $:, j$ ))` if the  
 arguments are of numeric type and has the value  
`ANY(MATRIX_A( $i, :$ ) .AND. MATRIX_B( $:, j$ ))` if  
 the arguments are of logical type.

Case 2 Element  $(j)$  of the result has the value  
`SUM(MATRIX_A( $:$ ) * MATRIX_B( $:, j$ ))` if the  
 arguments are of numeric type and has the value  
`ANY(MATRIX_A( $:$ ) .AND. MATRIX_B( $:, j$ ))` if the  
 arguments are of logical type.

Case 3 Element  $(i)$  of the result has the value  
`SUM(MATRIX_A( $i, :$ ) * MATRIX_B( $:$ ))` if the  
 arguments are of numeric type and has the value  
`ANY(MATRIX_A( $i, :$ ) .AND. MATRIX_B( $:$ ))` if the  
 arguments are of logical type.

### Examples

If `A` is the matrix

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \end{bmatrix}$$

and `B` is the matrix

$$\begin{bmatrix} 1 & 2 \\ 2 & 3 \\ 3 & 4 \end{bmatrix}$$

and `x` is the vector  $[1, 2]$  and `y` is the vector  $[1, 2, 3]$ .

Case 1 The result of `MATMUL(A, B)` is the matrix-matrix  
 product `AB` with the value

$$\begin{bmatrix} 14 & 20 \\ 20 & 29 \end{bmatrix}$$

- Case 2      The result of `MATMUL(X, A)` is the vector-matrix product `XA` with the value [5, 8, 11].
- Case 3      The result of `MATMUL(A, Y)` is the matrix-vector product `AY` with the value [14, 20].

---

## MAX(A1, A2, A3, ...)

---

### Optional Arguments

A3, ...

### Description

Maximum value.

### Class

Elemental function.

### Arguments

The arguments must all have the same type which must be integer or real, and they must all have the same kind type parameter.

### Result Type and Type Parameter

Same as the arguments.

### Result Value

The value of the result is that of the largest argument.

**Examples**

`MAX(-9.0, 7.0, 2.0)` has the value 7.0.

`MAX(-1.0_HIGH/3, -0.1_HIGH)` is `-0.1_HIGH`.

---

## MAXEXPONENT(X)

---

**Description**

Returns the maximum exponent in the model representing numbers of the same type and kind type parameter as the argument.

**Class**

Inquiry function.

**Argument**

`x` must be of type real. It may be scalar or array valued.

**Result Type, Type Parameter, and Shape**

Default integer scalar.

**Result Value**

The result has the value  $e_{\max}$ , as defined in the section “[The Real Number System Model](#)”.

**Example**

`MAXEXPONENT(X)` has the value 128 for real `x`, whose model is described in the section “[The Real Number System Model](#)”.

---

## MAXLOC(ARRAY, MASK)

---

### Optional Argument

MASK

### Description

Returns the location of the first element of `ARRAY` having the maximum value of the elements identified by `MASK`.

### Class

Transformational function.

### Arguments

<code>ARRAY</code>	must be of type integer or real. It must not be scalar.
<code>MASK</code> (optional)	must be of type logical and must be conformable with <code>ARRAY</code> .

### Result Type, Type Parameter, and Shape

The result is of type default integer; it is an array of rank one and of size equal to the rank of `ARRAY`.

**Result Value**

- Case 1      If `MASK` is absent, the result is a rank-one array whose element values are the values of the subscripts of an element of `ARRAY` whose value equals the maximum value of all of the elements of `ARRAY`.
- The  $i$ th subscript returned lies in the range 1 to  $e_i$ , where  $e_i$  is the extent of the  $i$ th dimension of `ARRAY`.
- If more than one element has the maximum value, the element whose subscripts are returned is the first such element, taken in array element order. If `ARRAY` has size zero, the value of the result is processor-dependent.
- Case 2      If `MASK` is present, the result is a rank-one array whose element values are the values of the subscripts of an element of `ARRAY`, corresponding to a `.TRUE.` element of `MASK`, whose value equals the maximum value of all such elements of `ARRAY`.
- The  $i$ th subscript returned lies in the range 1 to  $e_i$ , where  $e_i$  is the extent of the  $i$ th dimension of `ARRAY`.
- If more than one such element has the maximum value, the element whose subscripts are returned is the first such element taken in array element order.
- If there are no such elements (that is, if `ARRAY` has size zero or every element of `MASK` has the value `.FALSE.`), the value of the result is processor-dependent.
- In both cases, an element of the result is undefined if the processor cannot represent the value as a default integer.

**Examples**

Case 1                    The value of `MAXLOC(( / 2, 6, 4, 6 / ))` is [2].

                          If the array B is declared

```
INTEGER, DIMENSION(4:7) :: B = ( / 8, 6, 3, 1 / )
```

                          the value of `MAXLOC(B)` is [1].

Case 2                    If A has the value

$$\begin{bmatrix} 0 & \text{D}5 & 8 & \text{D}3 \\ 3 & 4 & \text{D}1 & 2 \\ 1 & 5 & 6 & \text{D}4 \end{bmatrix}$$

                          then `MAXLOC(A, MASK = A .LT. 6)` has the value [3, 2]. Note that this is true even if A has a declared lower bound other than 1.

---

## MAXVAL(ARRAY, DIM, MASK)

---

**Optional Arguments**

DIM, MASK

**Description**

Maximum value of the elements of `ARRAY` along dimension `DIM` that correspond to the `.TRUE.` elements of `MASK`.

**Class**

Transformational function.



## Arguments

ARRAY	must be of type integer or real. It must not be scalar.
DIM (optional)	must be scalar and of type integer with a value in the range $1 \leq \text{DIM} \leq n$ where $n$ is the rank of ARRAY. The corresponding actual argument must not be an optional dummy argument.
MASK (optional)	must be of type logical and must be conformable with ARRAY.

## Result Type, Type Parameter, and Shape

The result is of the same type and kind type parameter as ARRAY.

It is scalar if DIM is absent or ARRAY has rank one; otherwise, the result is an array of rank  $n-1$  and of shape  $(d_1, d_2, \dots, d_{\text{DIM}-1}, d_{\text{DIM}+1}, \dots, d_n)$  where  $(d_1, d_2, \dots, d_n)$  is the shape of ARRAY.

## Result Value

- Case 1      The result of `MAXVAL(ARRAY)` has a value equal to the maximum value of all the elements of ARRAY or has the value of the negative number of the largest magnitude supported by the processor for numbers of the type and kind type parameter of ARRAY if ARRAY has size zero.
- Case 2      The result of `MAXVAL(ARRAY, MASK = MASK)` has a value equal to the maximum value of the elements of ARRAY corresponding to `.TRUE.` elements of MASK or has the value of the negative number of the largest magnitude supported by the processor for numbers of the same type and kind type parameter as ARRAY if there are no `.TRUE.` elements.
- Case 3      If ARRAY has rank one, `MAXVAL(ARRAY, DIM [ , MASK ])` has a value equal to that of `MAXVAL(ARRAY [ , MASK = MASK ])`. Otherwise, the value of element  $(s_1, s_2, \dots, s_{\text{DIM}-1}, s_{\text{DIM}+1}, \dots, s_n)$  of `MAXVAL(ARRAY, DIM [ , MASK ])` is equal to the following:

`MAXVAL(ARRAY( $s_1, s_2, \dots, s_{\text{DIM}-1}, :, s_{\text{DIM}+1}, \dots, s_n$ ) [ , MASK = MASK( $s_1, s_2, \dots, s_{\text{DIM}-1}, :, s_{\text{DIM}+1}, \dots, s_n$ ) ] )`

**Examples**

- Case 1            The value of `MAXVAL(( / 1, 2, 3 / ))` is 3.
- Case 2            `MAXVAL(C, MASK = C .LT. 0.0)` finds the maximum of the negative elements of `C`.
- Case 3            If `B` is the array
- $$\begin{bmatrix} 1 & 3 & 5 \\ 2 & 4 & 6 \end{bmatrix}$$
- then `MAXVAL(B, DIM = 1)` is [2, 4, 6] and  
`MAXVAL(B, DIM = 2)` is [5, 6].

---

**MCLOCK()**

---

**Description**

Return time accounting for a program.

**Class**

Inquiry nonstandard function.

**Result Type**

Integer.

**Result Value**

The value returned, in units of microseconds, is the sum of the current process's user time and the user and system time of all its child processes.

---

## MERGE(TSOURCE, FSOURCE, MASK)

---

### Description

Choose alternative value according to the value of a mask.

### Class

Elemental function.

### Arguments

TSOURCE	may be of any type.
FSOURCE	must be of the same type and type parameters as TSOURCE.
MASK	must be of type logical.

### Result Type and Type Parameters

Same as TSOURCE.

### Result Value

The result is TSOURCE if MASK is `.TRUE.` and FSOURCE otherwise.

### Examples

If TSOURCE is the array  $\begin{bmatrix} 1 & 6 & 5 \\ 2 & 4 & 6 \end{bmatrix}$

and FSOURCE is the array  $\begin{bmatrix} 0 & 3 & 2 \\ 7 & 4 & 8 \end{bmatrix}$

and MASK is the array  $\begin{bmatrix} T & . & T \\ . & . & T \end{bmatrix}$

then where “T” represents `.TRUE.` and “.” represents `.FALSE.`, then  
`MERGE(TSOURCE, FSOURCE, MASK)` is

$$\begin{bmatrix} 1 & 3 & 5 \\ 7 & 4 & 6 \end{bmatrix}$$

The value of `MERGE(1.0, 0.0, K > 0)` is 1.0 for  $K = 5$  and 0.0 for  $K = -2$ .

---

## MIN(A1, A2, A3, ...)

---

### Optional Arguments

A3, ...

### Description

Minimum value.

### Class

Elemental function.

### Arguments

The arguments must all be of the same type, which must be integer or real, and they must all have the same kind type parameter.

### Result Type and Type Parameter

Same as the arguments.

### Result Value

The value of the result is that of the smallest argument.

**Examples**

`MIN(-9.0, 7.0, 2.0)` has the value `-9.0`.

`MIN(-0.4_HIGH, -1.0_HIGH/3)` is `-0.4_HIGH`.

---

**MINEXPONENT(X)**

---

**Description**

Returns the minimum exponent in the model representing numbers of the same type and kind type parameter as the argument.

**Class**

Inquiry function.

**Argument**

`x` must be of type real. It may be scalar or array valued.

**Result Type, Type Parameter, and Shape**

Default integer scalar.

**Result Value**

The result has the value  $e_{\min}$ , as defined in the section “[The Real Number System Model](#)”.

**Example**

`MINEXPONENT(X)` has the value `-125` for real `x`, whose model is described in “[The Real Number System Model](#)”.

---

## MINLOC(ARRAY, MASK)

---

### Optional Argument

MASK

### Description

Returns the location of the first element of `ARRAY` having the minimum value of the elements identified by `MASK`.

### Class

Transformational function.

### Arguments

<code>ARRAY</code>	must be of type integer or real. It must not be scalar.
<code>MASK</code> (optional)	must be of type logical and must be conformable with <code>ARRAY</code> .

### Result Type, Type Parameter, and Shape

The result is of type default integer; it is an array of rank one and of size equal to the rank of `ARRAY`.

### Result Value

Case 1	If <code>MASK</code> is absent, the result is a rank-one array whose element values are the values of the subscripts of an element of <code>ARRAY</code> whose value equals the minimum value of all the elements of <code>ARRAY</code> .  The $i$ th subscript returned lies in the range 1 to $e_i$ , where $e_i$ is the extent of the $i$ th dimension of <code>ARRAY</code> .
--------	---

If more than one element has the minimum value, the element whose subscripts are returned is the first such element, taken in array element order. If `ARRAY` has size zero, the value of the result is processor-dependent.

Case 2

If `MASK` is present, the result is a rank-one array whose element values are the values of the subscripts of an element of `ARRAY`, corresponding to a `.TRUE.` element of `MASK`, whose value equals the minimum value of all such elements of `ARRAY`.

The  $i$ th subscript returned lies in the range 1 to  $e_i$ , where  $e_i$  is the extent of the  $i$ th dimension of `ARRAY`. If more than one such element has the minimum value, the element whose subscripts are returned is the first such element taken in array element order.

If `ARRAY` has size zero or every element of `MASK` has the value `.FALSE.`, the value of the result is processor-dependent.

In both cases, an element of the result is undefined if the processor cannot represent the value as a default integer.

## Examples

Case 1            The value of `MINLOC(( / 4, 3, 6, 3 / ))` is [2].

If the array `B` is declared

```
INTEGER, DIMENSION(4:7) :: B = ( / 8, 6, 3, 1 / )
```

the value of `MINLOC(B)` is [4]

Case 2

If `A` has the value

$$\begin{bmatrix} 0 & \text{D}5 & 8 & \text{D}3 \\ 3 & 4 & \text{D}1 & 2 \\ 1 & 5 & 6 & \text{D}4 \end{bmatrix}$$

then `MINLOC(A, MASK = A .GT. -4)` has the value [1, 4]. Note that this is true even if `A` has a declared lower bound other than 1.

---

## MINVAL(**ARRAY**, **DIM**, **MASK**)

---

### Optional Arguments

**DIM**, **MASK**

### Description

Minimum value of all the elements of **ARRAY** along dimension **DIM** corresponding to **.TRUE.** elements of **MASK**.

### Class

Transformational function.

### Arguments

<b>ARRAY</b>	must be of type integer or real. It must not be scalar.
<b>DIM</b> (optional)	must be scalar and of type integer with a value in the range $1 \leq \text{DIM} \leq n$ , where $n$ is the rank of <b>ARRAY</b> . The corresponding actual argument must not be an optional dummy argument.
<b>MASK</b> (optional)	must be of type logical and must be conformable with <b>ARRAY</b> .

### Result Type, Type Parameter, and Shape

The result is of the same type and kind type parameter as **ARRAY**. It is scalar if **DIM** is absent or **ARRAY** has rank one; otherwise, the result is an array of rank  $n-1$  and of shape  $(d_1, d_2, \dots, d_{\text{DIM}-1}, d_{\text{DIM}+1}, \dots, d_n)$  where  $(d_1, d_2, \dots, d_n)$  is the shape of **ARRAY**.



## Result Value

- Case 1 The result of `MINVAL (ARRAY)` has a value equal to the minimum value of all the elements of `ARRAY` or has the value of the positive number of the largest magnitude supported by the processor for numbers of the type and kind type parameter of `ARRAY` if `ARRAY` has size zero.
- Case 2 The result of `MINVAL (ARRAY, MASK = MASK)` has a value equal to the minimum value of the elements of `ARRAY` corresponding to `.TRUE.` elements of `MASK` or has the value of the positive number of the largest magnitude supported by the processor for numbers of the same type and kind type parameter as `ARRAY` if there are no `.TRUE.` elements.
- Case 3 If `ARRAY` has rank one, `MINVAL (ARRAY, DIM [ ,MASK])` has a value equal to that of `MINVAL (ARRAY [ ,MASK = MASK])`. Otherwise, the value of element  $(s_1, s_2, \dots, s_{\text{DIM}-1}, s_{\text{DIM}+1}, \dots, s_n)$  of `MINVAL (ARRAY, DIM [ ,MASK])` is equal to the following:
- $$\text{MINVAL}(\text{ARRAY}(s_1, s_2, \dots, s_{\text{DIM}-1}, :, s_{\text{DIM}+1}, \dots, s_n) [, \text{MASK} = \text{MASK}(s_1, s_2, \dots, s_{\text{DIM}-1}, :, s_{\text{DIM}+1}, \dots, s_n) ] )$$

## Examples

- Case 1 The value of `MINVAL ((/ 1, 2, 3 /))` is 1.
- Case 2 `MINVAL (C, MASK = C .GT. 0.0)` forms the minimum of the positive elements of `C`.
- Case 3 If `B` is the array
- $$\begin{bmatrix} 1 & 3 & 5 \\ 2 & 4 & 6 \end{bmatrix}$$
- then `MINVAL (B, DIM = 1)` is `[1, 3, 5]` and `MINVAL (B, DIM = 2)` is `[1, 2]`.

---

## MOD(A, P)

---

### Description

Remainder function.

### Class

Elemental function.

### Arguments

A must be of type integer or real.

P must be of the same type and kind type parameter as A.

### Result Type and Type Parameter

Same as A.

### Result Value

If  $P \neq 0$ , the value of the result is  $A - \text{INT}(A/P) * P$ . If  $P=0$ , the result is processor-dependent.

### Examples

`MOD(3.0, 2.0)` has the value 1.0.

`MOD(8, 5)` has the value 3.

`MOD(-8, 5)` has the value -3.

`MOD(8, -5)` has the value 3.

`MOD(-8, -5)` has the value -3.

`MOD(2.0_HIGH, 3.0_HIGH)` has the value 2.0\_HIGH.

---

## MODULO(A, P)

---

### Description

Modulo function.

### Class

Elemental function.

### Arguments

A must be of type integer or real.

P must be of the same type and kind type parameter as A.

### Result Type and Type Parameter

Same as A.

### Result Value

Case 1 A is of type integer. If  $P \neq 0$ ,  $\text{MODULO}(A, P)$  has the value  $R$  such that  $A = Q \times P + R$ , where  $Q$  is an integer, the inequalities  $0 \leq R < P$  hold if  $P > 0$ , and  $P < R \leq 0$  hold if  $P < 0$ . If  $P = 0$ , the result is processor-dependent.

Case 2 A is of type real. If  $P \neq 0$ , the value of the result is  $A - \text{FLOOR}(A / P) * P$ . If  $P = 0$ , the result is processor-dependent.

### Examples

$\text{MODULO}(8, 5)$  has the value 3.

$\text{MODULO}(-8, 5)$  has the value 2.

$\text{MODULO}(8, -5)$  has the value -2.

$\text{MODULO}(-8, -5)$  has the value -3.

$\text{MODULO}(3.0, 2.0)$  has the value 1.0.

$\text{MODULO}(2.0\_HIGH, 3.0\_HIGH)$  has the value 2.0\_HIGH.

---

## MVBITS(FROM, FROMPOS, LEN, TO, TOPOS)

---

### Description

Copies a sequence of bits from one data object to another.

### Class

Elemental subroutine.

### Arguments

FROM	must be of type integer. It is an <code>INTENT ( IN )</code> argument.
FROMPOS	must be of type integer and nonnegative. It is an <code>INTENT ( IN )</code> argument. <code>FROMPOS + LEN</code> must be less than or equal to <code>BIT_SIZE ( FROM )</code> . The model for the interpretation of an integer value as a sequence of bits is in the section “ <a href="#">The Bit Model</a> ”.
LEN	must be of type integer and nonnegative. It is an <code>INTENT ( IN )</code> argument.
TO	must be a variable of type integer with the same kind type parameter value as <code>FROM</code> and may be the same variable as <code>FROM</code> . It is an <code>INTENT ( INOUT )</code> argument.  TO is set by copying the sequence of bits of length <code>LEN</code> , starting at position <code>FROMPOS</code> of <code>FROM</code> to position <code>TOPOS</code> of <code>TO</code> . No other bits of <code>TO</code> are altered. On return, the <code>LEN</code> bits of <code>TO</code> starting at <code>TOPOS</code> are equal to the value that the <code>LEN</code> bits of <code>FROM</code> starting at <code>FROMPOS</code> had on entry.  The model for the interpretation of an integer value as a sequence of bits is in the section “ <a href="#">The Bit Model</a> ”.

TOPOS must be of type integer and nonnegative. It is an  
INTENT(IN) argument. TOPOS + LEN must be less than  
or equal to BIT\_SIZE(TO).

### Examples

If TO has the initial value 6, the value of TO after the statement CALL  
MVBITS(7, 2, 2, TO, 0) is 5.

After the statement

```
CALL MVBITS (PATTERN, 0_SHORT, 1_SHORT,  
            PATTERN, 7_SHORT)
```

is executed, the integer variable PATTERN of kind SHORT has a leading bit  
that is identical to its terminal bit.

---

## NEAREST(X, S)

---

### Description

Returns the nearest different machine representable number in a given  
direction.

### Class

Elemental function.

### Arguments

X must be of type real.  
S must be of type real and not equal to zero.

### Result Type and Type Parameter

Same as X.

**Result Value**

The result has a value equal to the machine representable number distinct from  $x$  and nearest to it in the direction of the infinity with the same sign as  $S$ .

**Example**

`NEAREST(3.0, 2.0)` has the value  $3+2^{-22}$  on a machine whose representation is that of the model described in the section “[The Real Number System Model](#)”.

---

## NINT(A, KIND)

---

**Optional Argument**

KIND

**Description**

Nearest integer.

**Class**

Elemental function.

**Arguments**

$A$  must be of type real.

KIND (optional) must be a scalar integer initialization expression.

**Result Type and Type Parameter**

Integer. If KIND is present, the kind type parameter is that specified by KIND; otherwise, the kind type parameter is that of default integer type.

**Result Value**

If  $A > 0$ , `NINT(A)` has the value `INT(A+0.5)`; if  $A \leq 0$ , `NINT(A)` has the value `INT(A-0.5)`. The result is undefined if the processor cannot represent the result in the specified integer type.

**Examples**

`NINT(2.783)` has the value 3.

`NINT(-1.9999999999_HIGH)` has the value -2.

---

## NOT(I)

---

**Description**

Performs a bitwise logical complement.

**Class**

Elemental function.

**Argument**

`I` must be of type integer.

**Result Type and Type Parameter**

Same as `I`.

## Result Value

The result has the value obtained by complementing  $I$  bit-by-bit according to the following truth table:

$I$	$\text{NOT}(I)$
1	0
0	1

The model for the interpretation of an integer value as a sequence of bits is in the section “[The Bit Model](#)”.

## Example

If  $I$  is an integer of kind `SHORT` and has a value that is equal to 01010101 (base 2),  $\text{NOT}(I)$  has a value that is equal to 10101010 (base 2).

---

## OR(I, J)

---

### Description

Bitwise logical OR.

### Class

Elemental nonstandard function.

### Arguments.

- |     |  |
|-----|--|
| $I$ | must be of type integer.   |
| $J$ | must be of type integer with the same kind type parameter as $I$ . |



**Result Type and Type Parameter**

Same as `I`.

**Result Value**

The result has the value obtained by performing an OR on `I` and `J` bit-by-bit according to the following truth table:

<code>I</code>	<code>J</code>	<code>OR ( I , J )</code>
1	1	1
1	0	1
0	1	1
0	0	0

The model for interpreting an integer value as a sequence of bits is in the section “[The Bit Model](#)”.

**Example**

`OR( 3 , 5 )` is 7. (Binary 0011 OR with binary 0101 is binary 0111.)

---

## PACK(ARRAY, MASK, VECTOR)

---

**Optional Argument**

`VECTOR`

**Description**

Pack an array into an array of rank one under the control of a mask.

**Class**

Transformational function.

**Arguments**

ARRAY	may be of any type. It must not be scalar.
MASK	must be of type logical and must be conformable with ARRAY.
VECTOR (optional)	must be of the same type and type parameters as ARRAY and must have rank one. VECTOR must have at least as many elements as there are <code>.TRUE.</code> elements in MASK. If MASK is scalar with the value <code>.TRUE.</code> , VECTOR must have at least as many elements as there are in ARRAY.

**Result Type, Type Parameter, and Shape**

The result is an array of rank one with the same type and type parameters as ARRAY. If VECTOR is present, the result size is that of VECTOR; otherwise, the result size is the number  $t$  of `.TRUE.` elements in MASK unless MASK is scalar with the value `.TRUE.`, in which case the result size is the size of ARRAY.

**Result Value**

Element  $i$  of the result is the element of ARRAY that corresponds to the  $i$ th `.TRUE.` element of MASK, taking elements in array element order, for  $i = 1, 2, \dots, t$ . If VECTOR is present and has size  $n > t$ , element  $i$  of the result has the value `VECTOR( $i$ )`, for  $i = t+1, \dots, n$ .

**Examples**

The nonzero elements of an array M with the value

$$\begin{bmatrix} 0 & 0 & 0 \\ 9 & 0 & 0 \\ 0 & 0 & 7 \end{bmatrix}$$

may be “gathered” by the function `PACK`.

The result of `PACK(M, MASK = M .NE. 0)` is `[9, 7]`.

The result of `PACK(M, M .NE. 0, VECTOR = (/ 2, 4, 6, 8, 10, 12 /))` is `[9, 7, 6, 8, 10, 12]`.

---

## PRECISION(X)

---

### Description

Returns the decimal precision in the model representing real numbers with the same kind type parameter as the argument.

### Class

Inquiry function.

### Argument

x must be of type real or complex. It may be scalar or array valued.

### Result Type, Type Parameter, and Shape

Default integer scalar.

### Result Value

The result has the value  $\text{INT}((p-1) * \text{LOG}_{10}(b)) + k$ . The values of  $b$  and  $p$  are as defined in the section “[The Real Number System Model](#)” for the model representing real numbers with the same kind type parameter as  $x$ . The value of  $k$  is 1 if  $b$  is an integral power of 10 and 0 otherwise.

**Example.** `PRECISION(X)` has the value  $\text{INT}(23 * \text{LOG}_{10}(2.)) = \text{INT}(6.92\dots) = 6$  for real  $x$  whose model is described in the section “[The Real Number System Model](#)”.

---

## PRESENT(A)

---

### Description

Determine whether an optional argument is present.

### Class

Inquiry function.

### Argument

A must be the name of an optional dummy argument that is accessible in the procedure in which the PRESENT function reference appears.

### Result Type and Type Parameters

Default logical scalar.

### Result Value

The result has the value `.TRUE.` if A is present and otherwise has the value `.FALSE.`

### Example

```
SUBROUTINE SUB (A, B, EXTRA)
  REAL A, B, C
  REAL, OPTIONAL :: EXTRA
  . . .
  IF (PRESENT (EXTRA)) THEN
    C = EXTRA
  ELSE
    C = (A+B)/2
  END IF
  . . .
END
```

If SUB is called with the statement  
CALL SUB (10.0, 20.0, 30.0)  
then C is set to 30.0. If SUB is called with the statement  
CALL SUB (10.0, 20.0)  
then C is set to 15.0.

An optional argument that is not present must not be referenced or defined  
or supplied as a nonoptional actual argument, except as the argument of the  
PRESENT intrinsic function.

---

# PRODUCT (ARRAY, DIM, MASK)

---

## Optional Arguments

DIM, MASK

## Description

Product of all the elements of ARRAY along dimension DIM corresponding to  
the .TRUE. elements of MASK.

## Class

Transformational function.

## Arguments

- |                |   |
|----------------|---|
| ARRAY          | must be of type integer, real, or complex. It must not be scalar.   |
| DIM (optional) | must be scalar and of type integer with a value in the range $1 \leq \text{DIM} \leq n$ , where $n$ is the rank of ARRAY. The corresponding actual argument must not be an optional dummy argument. |

MASK (optional) must be of type logical and must be conformable with ARRAY.

### Result Type, Type Parameter, and Shape

The result is of the same type and kind type parameter as ARRAY. It is scalar if DIM is absent or ARRAY has rank one; otherwise, the result is an array of rank  $n-1$  and of shape  $(d_1, d_2, \dots, d_{\text{DIM}-1}, d_{\text{DIM}+1}, \dots, d_n)$  where  $(d_1, d_2, \dots, d_n)$  is the shape of ARRAY.

### Result Value

- Case 1 The result of `PRODUCT(ARRAY)` has a value equal to a processor-dependent approximation to the product of all the elements of ARRAY or has the value one if ARRAY has size zero.
- Case 2 The result of `PRODUCT(ARRAY, MASK = msk)` has a value equal to a processor-dependent approximation to the product of the elements of ARRAY corresponding to the `.TRUE.` elements of msk or has the value one if there are no `.TRUE.` elements.
- Case 3 If ARRAY has rank one, `PRODUCT(ARRAY, DIM [ ,msk])` has a value equal to that of `PRODUCT(ARRAY [ ,MASK = ask])`. Otherwise, the value of element  $(s_1, s_2, \dots, s_{\text{DIM}-1}, s_{\text{DIM}+1}, \dots, s_n)$  of `PRODUCT(ARRAY, DIM [ ,msk])` is equal to the following:

```
PRODUCT(ARRAY(s1, s2, ..., sDIM-1, :,
sDIM+1, ..., sn) [ , MASK = msk(s1, s2, ...,
sDIM-1, :, sDIM+1, ..., sn) ] )
```

### Examples

- Case 1 The value of `PRODUCT(( / 1, 2, 3 / ))` and `PRODUCT(( / 1, 2, 3 / ), DIM=1)` is 6.
- Case 2 `PRODUCT(C, MASK = C .GT. 0.0)` forms the product of the positive elements of C.

Case 3

If B is the array

$$\begin{bmatrix} 1 & 3 & 5 \\ 2 & 4 & 6 \end{bmatrix}$$

then `PRODUCT(B, DIM = 1)` is [2, 12, 30] and  
`PRODUCT(B, DIM = 2)` is [15, 48].

---

## RADIX(X)

---

### Description

Returns the base of the model representing numbers of the same type and kind type parameter as the argument.

### Class

Inquiry function.

### Argument

x must be of type integer or real. It may be scalar or array valued.

### Result Type, Type Parameter, and Shape

Default integer scalar.

### Result Value

The result has the value  $r$  if x is of type integer and the value  $b$  if x is of type real, where  $r$  and  $b$  are as defined in the section “[The Real Number System Model](#)”.

### Example

`RADIX(X)` has the value 2 for real x whose model is described in the section “[The Real Number System Model](#)”.

---

## RANDOM\_NUMBER(HARVEST)

---

### Description

Returns one pseudorandom number or an array of pseudorandom numbers from the uniform distribution over the range  $0 \leq x < 1$ .

### Class

Subroutine.

### Argument

HARVEST must be of type real. It is an `INTENT(OUT)` argument. It may be a scalar or an array variable. It is set to contain pseudorandom numbers from the uniform distribution in the interval  $0 \leq x < 1$ .

### Examples

```
REAL X, Y (10, 10)
! Initialize X with a pseudorandom number
CALL RANDOM_NUMBER (HARVEST = X)
CALL RANDOM_NUMBER (Y)
! X & Y contain
! uniformly distributed random numbers
```



---

## RANDOM\_SEED(SIZE, PUT, GET)

---

### Optional Arguments

SIZE, PUT, GET

### Description

Restarts or queries the pseudorandom number generator used by RANDOM\_NUMBER.

### Class

Subroutine.

### Arguments

There must either be exactly one or no arguments present.

- SIZE (optional)    must be scalar and of type default integer. It is an INTENT(OUT) argument. It is set to the number  $N$  of integers that the processor uses to hold the value of the seed.
- PUT (optional)    must be a default integer array of rank one and size  $\geq N$ . It is an INTENT(IN) argument. It is used by the processor to set the seed value.
- GET (optional)    must be a default integer array of rank one and size  $\geq N$ . It is an INTENT(OUT) argument. It is set by the processor to the current value of the seed. If no argument is present, the processor sets the seed to a processor-dependent value.

### Examples

```
CALL RANDOM_SEED
! Processor initialization
CALL RANDOM_SEED (SIZE = K)           ! Sets K = N
CALL RANDOM_SEED (PUT = SEED (1 : K)) ! Set user seed
CALL RANDOM_SEED (GET = OLD (1 : K))  ! Read current
seed
```

---

## RANGE(X)

---

### Description

Returns the decimal exponent range in the model representing integer or real numbers with the same kind type parameter as the argument.

### Class

Inquiry function.

### Argument

x must be of type integer, real, or complex. It may be scalar or array valued.

### Result Type, Type Parameter, and Shape

Default integer scalar.

### Result Value

- |        |  |
|--------|--|
| Case 1 | For an integer argument, the result has the value $\text{INT}(\text{LOG}_{10}(\textit{huge}))$ , where <i>huge</i> is the largest positive integer in the model representing integer numbers with same kind type parameter as x (see the section “ <a href="#">The Integer Number System Model</a> ”).   |
| Case 2 | For a real or complex argument, the result has the value $\text{INT}(\text{MIN}(\text{LOG}_{10}(\textit{huge}), -\text{LOG}_{10}(\textit{tiny})))$ , where <i>huge</i> and <i>tiny</i> are the largest and smallest positive numbers in the model representing real numbers with the same value for the kind type parameter as x (see the section “ <a href="#">The Real Number System Model</a> ”). |

**Example**

`RANGE(X)` has the value 38 for real `x`, whose model is described in “[The Real Number System Model](#)”, because in this case  $huge = (1 - 2^{-24}) \times 2^{127}$  and  $tiny = 2^{-127}$ .

---

# REAL(A, KIND)

---

**Optional Argument**

`KIND`

**Description**

Convert to real type.

**Class**

Elemental function.

**Arguments**

`A` must be of type integer, real, or complex.

`KIND` (optional) must be a scalar integer initialization expression.

**Result Type and Type Parameter**

**Real**

- |        |   |
|--------|---|
| Case 1 | If <code>A</code> is of type integer or real and <code>KIND</code> is present, the kind type parameter is that specified by <code>KIND</code> .<br><br>If <code>A</code> is of type integer or real and <code>KIND</code> is not present, the kind type parameter is the processor-dependent kind type parameter for the default real type. |
| Case 2 | If <code>A</code> is of type complex and <code>KIND</code> is present, the kind type parameter is that specified by <code>KIND</code> .   |

If `A` is of type complex and `KIND` is not present, the kind type parameter is the kind type parameter of `A`.

### Result Value

- |        |   |
|--------|---|
| Case 1 | If <code>A</code> is of type integer or real, the result is equal to a processor-dependent approximation to <code>A</code> .          |
| Case 2 | If <code>A</code> is of type complex, the result is equal to a processor-dependent approximation to the real part of <code>A</code> . |

### Examples

`REAL(-3)` has the value `-3.0`.

`REAL(Z)` has the same kind type parameter and the same value as the real part of the complex variable `Z`.

`REAL(2.0_HIGH/3.0)` is `0.6666666666666666` with kind `HIGH`.

---

## REPEAT(String, NCOPIES)

---

### Description

Concatenate several copies of a string.

### Class

Transformational function.

### Arguments

- |                      |   |
|----------------------|---|
| <code>String</code>  | must be scalar and of type character.                               |
| <code>NCOPIES</code> | must be scalar and of type integer. Its value must not be negative. |

**Result Type, Type Parameter, and Shape**

Character scalar of length `NCOPIES` times that of `STRING`, with the same kind type parameter as `STRING`.

**Result Value**

The value of the result is the concatenation of `NCOPIES` copies of `STRING`.

**Examples**

`REPEAT( 'H' , 2 )` has the value `HH`.

`REPEAT( 'XYZ' , 0 )` has the value of a zero-length string.

---

## RESHAPE(SOURCE, SHAPE, PAD, ORDER)

---

**Optional Arguments**

`PAD`, `ORDER`

**Description**

Constructs an array of a specified shape from the elements of a given array.

**Class**

Transformational function.

**Arguments**

`SOURCE` may be of any type. It must be array valued. If `PAD` is absent or of size zero, the size of `SOURCE` must be greater than or equal to `PRODUCT( SHAPE )`. The size of the result is the product of the values of the elements of `SHAPE`.

SHAPE	must be of type integer, rank one, and constant size. Its size must be positive and less than 8. It must not have an element whose value is negative.
PAD (optional)	must be of the same type and type parameters as SOURCE. PAD must be array valued.
ORDER (optional)	must be of type integer, must have the same shape as SHAPE, and its value must be a permutation of [1, 2, ..., $n$ ], where $n$ is the size of SHAPE. If absent, it is as if it were present with value [1, 2, ..., $n$ ].

### Result Type, Type Parameter, and Shape

The result is an array of shape SHAPE (that is, `SHAPE(RESHAPE(SOURCE, SHAPE, PAD, ORDER))` is equal to SHAPE) with the same type and type parameters as SOURCE.

### Result Value

The elements of the result, taken in permuted subscript order `ORDER(1), ..., ORDER( $n$ )`, are those of SOURCE in normal array element order followed if necessary by those of PAD in array element order, followed if necessary by additional copies of PAD in array element order.

### Examples

`RESHAPE((/ 1, 2, 3, 4, 5, 6 /), (/ 2, 3 /))` has the value

$$\begin{bmatrix} 1 & 3 & 5 \\ 2 & 4 & 6 \end{bmatrix}$$

`RESHAPE((/ 1, 2, 3, 4, 5, 6 /), (/ 2, 4 /), (/ 0, 0 /), (/ 2, 1 /))` has the value

$$\begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 0 & 0 \end{bmatrix}$$

---

## RNUM(I)

---

### Description

Convert character to real type.

### Class

Elemental nonstandard function.

### Argument

I must be of type character.

### Result

Default real type.

### Example

RNUM( " 821 . 003 " ) is 821.003 of type default real.

---

## RRSPACING(X)

---

### Description

Returns the reciprocal of the relative spacing of model numbers near the argument value.

### Class

Elemental function.

**Argument**

x must be of type real.

**Result Type and Type Parameter**

Same as x.

**Result Value**

The result has the value  $|x| \times b^{-e} \times b^p$ , where  $b$ ,  $e$ , and  $p$  are as defined in the section “[The Real Number System Model](#)”.

**Example**

`RRSPACING(-3.0)` has the value  $0.75 \times 2^{24}$  for reals whose model is described in the section “[The Real Number System Model](#)”.

---

**RSHFT(I, SHIFT)**

---

**Description**

Bitwise right shift.

**Class**

Elemental nonstandard function.

For details see “[RSHFT](#)” on page 120.



---

## RSHIFT(I, SHIFT)

---

### Description

Bitwise right shift.

### Class

Elemental nonstandard function.

For details see [“RSHIFT” on page 121](#).

---

## SCALE(X, I)

---

### Description

Returns  $x \times b^I$  where  $b$  is the base in the model representation of  $x$  (see the section [“The Real Number System Model”](#)).

### Class

Elemental function.

### Arguments

$x$	must be of type real.
$I$	must be of type integer.

### Result Type and Type Parameter

Same as  $x$ .

**Result Value**

The result has the value  $x \times b^i$ , where  $b$  is defined in the section “[The Real Number System Model](#)”, provided this result is within range; if not, the result is processor dependent.

**Example**

`SCALE(3.0, 2)` has the value 12.0 for reals whose model is described in “[The Real Number System Model](#)”.

---

## SCAN(String, Set, Back)

---

**Optional Argument**

BACK

**Description**

Scan a string for any one of the characters in a set of characters.

**Class**

Elemental function.

**Arguments**

STRING	must be of type character.
SET	must be of type character with the same kind type parameter as STRING
BACK (optional)	must be of type logical.

**Result Type and Type Parameter**

Default integer.

**Result Value**

- Case 1 If `BACK` is absent or is present with the value `.FALSE.` and if `STRING` contains at least one character that is in `SET`, the value of the result is the position of the leftmost character of `STRING` that is in `SET`.
- Case 2 If `BACK` is present with the value `.TRUE.` and if `STRING` contains at least one character that is in `SET`, the value of the result is the position of the rightmost character of `STRING` that is in `SET`.
- Case 3 The value of the result is zero if no character of `STRING` is in `SET` or if the length of `STRING` or `SET` is zero.

**Examples**

- Case 1 `SCAN( 'FORTRAN' , 'TR' )` has the value 3.
- Case 2 `SCAN( 'FORTRAN' , 'TR' , BACK = .TRUE. )` has the value 5.
- Case 3 `SCAN( 'FORTRAN' , 'BCD' )` has the value 0.

---

**SELECTED\_INT\_KIND(R)**

---

**Description**

Returns a value of the kind type parameter of an integer data type that represents all integer values  $n$  with  $-10^R < n < 10^R$ .

**Class**

Transformational function.

**Argument**

`R` must be scalar and of type integer.

## Result Type, Type Parameter, and Shape

Default integer scalar.

## Result Value

The result has a value equal to the value of the kind type parameter of an integer data type that represents all values  $n$  in the range of values  $n$  with  $-10^R < n < 10^R$ , or if no such kind type parameter is available on the processor, the result is  $-1$ .

If more than one kind type parameter meets the criteria, the value returned is the one with the smallest decimal exponent range, unless there are several such values, in which case the smallest of these kind values is returned.

## Example

`SELECTED_INT_KIND(6)` has the value `KIND(0)` on a machine that supports a default integer representation method with  $r=2$  and  $q=31$  as defined in the model for the integer number systems in “[The Integer Number System Model](#)”.

---

# SELECTED\_REAL\_KIND(P, R)

---

## Optional Arguments

P, R

## Description

Returns a value of the kind type parameter of a real data type with decimal precision of at least P digits and a decimal exponent range of at least R.

## Class

Transformational function.

## Arguments

At least one argument must be present.

P (optional)            must be scalar and of type integer.

R (optional)            must be scalar and of type integer.

## Result Type, Type Parameter, and Shape

Default integer scalar.

## Result Value

The result has a value equal to a value of the kind type parameter of a real data type with decimal precision, as returned by the function `PRECISION`, of at least P digits and a decimal exponent range, as returned by the function `RANGE`, of at least R.

If no such kind type parameter is available on the processor, the result is  $-1$  if the precision is not available,  $-2$  if the exponent range is not available, and  $-3$  if neither is available.

If more than one kind type parameter value meets the criteria, the value returned is the one with the smallest decimal precision, unless there are several such values, in which case the smallest of these kind values is returned.

## Example

`SELECTED_REAL_KIND(6, 70)` has the value `KIND(0.0)` on a machine that supports a default real approximation method with  $p=16$ ,  $p=6$ ,  $e_{\min}=-64$ , and  $e_{\max}=63$  as defined in the model for the real number system in the section “[The Real Number System Model](#)”.

---

## SET\_EXPONENT(X, I)

---

### Description

Returns the model number whose fractional part is the fractional part of the model representation of  $x$  and whose exponent part is  $I$ .

### Class

Elemental function.

### Arguments

$x$  must be of type real.

$I$  must be of type integer.

### Result Type and Type Parameter

Same as  $x$ .

### Result Value

The result has the value  $x \times b^{I-e}$ , where  $b$  and  $e$  are as defined in the section “[The Real Number System Model](#)”, provided this result is within range; if not, the result is processor-dependent.

If  $x$  has value zero, the result has value zero.

### Example

`SET_EXPONENT(3.0, 1)` has the value 1.5 for reals whose model is as described in the section “[The Real Number System Model](#)”.

---

## SHAPE(SOURCE)

---

### Description

Returns the shape of an array or a scalar.

### Class

Inquiry function.

### Argument

`SOURCE` may be of any type. It may be array valued or scalar. It must not be a pointer that is disassociated or an allocatable array that is not allocated. It must not be an assumed-size array.

### Result Type, Type Parameter, and Shape

The result is a default integer array of rank one whose size is equal to the rank of `SOURCE`.

### Result Value

The value of the result is the shape of `SOURCE`.

### Examples

The value of `SHAPE(A(2:5, -1:1))` is `[4, 3]`.

The value of `SHAPE(3)` is the rank-one array of size zero.

---

## SIGN(A, B)

---

### Description

Absolute value of A times the sign of B.

### Class

Elemental function.

### Arguments

*A* must be of type integer or real.

*B* must be of the same type and kind type parameter as A.

### Result Type and Type Parameter

Same as A.

### Result Value

The value of the result is  $|A|$  if  $B \geq 0$  and  $-|A|$  if  $B < 0$ .

### Example

`SIGN(-3.0, 2.0)` has the value 3.0.

---

## SIN(X)

---

### Description

Sine function in radians.



**Class**

Elemental function.

**Argument**

$x$  must be of type real or complex.

**Result Type and Type Parameter**

Same as  $x$ .

**Result Value**

The result has a value equal to a processor-dependent approximation to  $\sin(x)$ .

If  $x$  is of type real, it is regarded as a value in radians.

If  $x$  is of type complex, its real part is regarded as a value in radians.

**Examples**

`SIN(1.0)` has the value 0.84147098.

`SIN((0.5_HIGH, 0.5))` has the value  $0.54061268571316 + 0.45730415318425i$  with kind `HIGH`.

---

## SIND(X)

---

**Description**

Sine function that accepts input in degrees.

**Class**

Elemental nonstandard function.

**Argument**

x must be of type real.

**Result Type and Type Parameter**

Same as x.

**Result Value**

The result has a value equal to a processor-dependent approximation to  $\sin(x)$ .

**Examples**

`SIND( 0 . 0 )` has the value 0.0.

`SIND( 30 . 0 )` has the value 0.5.

---

## SINH(X)

---

**Description**

Hyperbolic sine function.

**Class**

Elemental function.

**Argument**

x must be of type real.

**Result Type and Type Parameter**

Same as x.

**Result Value**

The result has a value equal to a processor-dependent approximation to  $\sinh(x)$ .

**Examples**

`SINH(1.0)` has the value 1.1752012.

`SINH(0.5_HIGH)` has the value 0.52109530549375 with kind `HIGH`.

---

## SIZE(`ARRAY`, `DIM`)

---

**Optional Argument**

`DIM`

**Description**

Returns the extent of an array along a specified dimension or the total number of elements in the array.

**Class**

Inquiry function.

**Arguments.**

`ARRAY` may be of any type. It must not be scalar. It must not be a pointer that is disassociated or an allocatable array that is not allocated. If `ARRAY` is an assumed-size array, `DIM` must be present with a value less than the rank of `ARRAY`.

`DIM` (optional) must be scalar and of type integer with a value in the range  $1 \leq \text{DIM} \leq n$ , where  $n$  is the rank of `ARRAY`.

**Result Type, Type Parameter, and Shape**

Default integer scalar.

**Result Value**

The result has a value equal to the extent of dimension DIM of ARRAY or, if DIM is absent, the total number of elements of ARRAY.

**Examples**

The value of `SIZE(A(2:5, -1:1), DIM=2)` is 3.

The value of `SIZE(A(2:5, -1:1))` is 12.

---

**SPACING(X)**

---

**Description**

Returns the absolute spacing of model numbers near the argument value.

**Class**

Elemental function.

**Argument**

x must be of type real.

**Result Type and Type Parameter**

Same as x.

**Result Value**

If x is not zero, the result has the value  $b^e \cdot p$ , where  $b$ ,  $e$ , and  $p$  are as defined in the section “[The Real Number System Model](#)”, provided this result is within range; otherwise, the result is the same as that of `TINY(X)`.

**Example**

`SPACING(3.0)` has the value  $2^{-22}$  for reals whose model is described in the section “[The Real Number System Model](#)”.

---

## SPREAD(SOURCE, DIM, NCOPIES)

---

### Description

Replicates an array by adding a dimension. Broadcasts several copies of `SOURCE` along a specified dimension (as in forming a book from copies of a single page) and thus forms an array of rank one greater.

### Class

Transformational function.

### Arguments

<code>SOURCE</code>	may be of any type. It may be scalar or array valued. The rank of <code>SOURCE</code> must be less than 7.
<code>DIM</code>	must be scalar and of type integer with value in the range $1 \leq \text{DIM} \leq n + 1$ , where $n$ is the rank of <code>SOURCE</code> .
<code>NCOPIES</code>	must be scalar and of type integer.

### Result Type, Type Parameter, and Shape

The result is an array of the same type and type parameters as `SOURCE` and of rank  $n + 1$ , where  $n$  is the rank of `SOURCE`.

Case 1	If <code>SOURCE</code> is scalar, the shape of the result is $(\text{MAX}(\text{NCOPIES}, 0))$ .
Case 2	If <code>SOURCE</code> is array valued with shape $(d_1, d_2, \dots, d_n)$ , the shape of the result is $(d_1, d_2, \dots, d_{\text{DIM}-1}, \text{MAX}(\text{NCOPIES}, 0), d_{\text{DIM}}, \dots, d_n)$ .

## Result Value

- Case 1 If SOURCE is scalar, each element of the result has a value equal to SOURCE.
- Case 2 If SOURCE is array valued, the element of the result with subscripts  $(r_1, r_2, \dots, r_{n+1})$  has the value  $\text{SOURCE}(r_1, r_2, \dots, r_{\text{DIM}-1}, r_{\text{DIM}+1}, \dots, r_{n+1})$ .

## Examples

- Case 1 `SPREAD("A", 1, 3)` is the character array (/ "A", "A", "A" /).

- Case 2 If A is the array [2, 3, 4], `SPREAD(A, DIM=1, NCOPIES=NC)` is the array

$$\begin{bmatrix} 2 & 3 & 4 \\ 2 & 3 & 4 \\ 2 & 3 & 4 \end{bmatrix}$$

if NC has the value 3 and is a zero-sized array if NC has the value 0.

---

## SQRT(X)

---

### Description

Square root.

### Class

Elemental function.

**Argument**

x must be of type real or complex. If x is real, its value must be greater than or equal to zero.

**Result Type and Type Parameter**

Same as x.

**Result Value**

The result has a value equal to a processor-dependent approximation to the square root of x.

A result of type complex is the principal value with the real part greater than or equal to zero. When the real part of the result is zero, the imaginary part is greater than or equal to zero.

**Examples**

`SQRT(4.0)` has the value 2.0.

`SQRT(5.0_HIGH)` has the value 2.23606774998 with kind HIGH.

---

**SUM(ARRAY, DIM, MASK)**

---

**Optional Arguments**

DIM, MASK

**Description**

Sum all the elements of `ARRAY` along dimension `DIM` corresponding to the `.TRUE.` elements of `MASK`.

**Class**

Transformational function.

**Arguments**

ARRAY	must be of type integer, real, or complex. It must not be scalar.
DIM (optional)	must be scalar and of type integer with a value in the range $1 \leq \text{DIM} \leq n$ , where $n$ is the rank of ARRAY. The corresponding actual argument must not be an optional dummy argument.
MASK (optional)	must be of type logical and must be conformable with ARRAY.

**Result Type, Type Parameter, and Shape**

The result is of the same type and kind type parameter as ARRAY. It is scalar if DIM is absent or ARRAY has rank one; otherwise, the result is an array of rank  $n-1$  and of shape  $(d_1, d_2, \dots, d_{\text{DIM}-1}, d_{\text{DIM}+1}, \dots, d_n)$  where  $(d_1, d_2, \dots, d_n)$  is the shape of ARRAY.

**Result Value**

Case 1	The result of <code>SUM(ARRAY)</code> has a value equal to a processor-dependent approximation to the sum of all the elements of ARRAY or has the value zero if ARRAY has size zero.
Case 2	The result of <code>SUM(ARRAY, MASK = msk)</code> has a value equal to a processor-dependent approximation to the sum of the elements of ARRAY corresponding to the <code>.TRUE.</code> elements of msk or has the value zero if there are no <code>.TRUE.</code> elements.
Case 3	If ARRAY has rank one, <code>SUM(ARRAY, DIM [,msk])</code> has a value equal to that of <code>SUM(ARRAY [,MASK = msk])</code> . Otherwise, the value of element $(s_1, s_2, \dots, s_{\text{DIM}-1}, s_{\text{DIM}+1}, \dots, s_n)$ of <code>SUM(ARRAY, DIM [,msk])</code> is equal to the following:

```
SUM(ARRAY(s1, s2, ..., sDIM-1, :, sDIM+1, ..., sn) [,
MASK=msk(s1, s2, ..., sDIM-1, :, sDIM+1, ..., sn)])
```



**Examples**

- Case 1            The value of SUM(( / 1, 2, 3 / )) and SUM(( / 1, 2, 3 / ), DIM=1) is 6.
- Case 2            SUM(C, MASK= C .GT. 0.0) forms the arithmetic sum of the positive elements of C.
- Case 3            If B is the array
- $$\begin{bmatrix} 1 & 3 & 5 \\ 2 & 4 & 6 \end{bmatrix}$$
- then SUM(B, DIM = 1) is [3, 7, 11] and SUM(B, DIM = 2) is [9, 12].

---

**SYSTEM\_CLOCK(COUNT, COUNT\_RATE, COUNT\_MAX)**

---

**Optional Arguments**

COUNT, COUNT\_RATE, COUNT\_MAX

**Description**

Returns integer data from a real-time clock.

**Class**

Subroutine.

**Arguments**

COUNT (optional)            must be scalar and of type default integer. It is an INTENT ( OUT ) argument. It is set to a processor-dependent value based on the current

value of the processor clock or to `-HUGE(0)` if there is no clock. The processor-dependent value is incremented by one for each clock count until the value `COUNT_MAX` is reached and is reset to zero at the next count. It lies in the range 0 to `COUNT_MAX` if there is a clock.

`COUNT_RATE` (optional) must be scalar and of type default integer. It is an `INTENT(OUT)` argument. It is set to the number of processor clock counts per second, or to zero if there is no clock.

`COUNT_MAX` (optional) must be scalar and of type default integer. It is an `INTENT(OUT)` argument. It is set to the maximum value that `COUNT` can have, or to zero if there is no clock.

### Example

If the processor clock is a 24-hour clock that registers time in 1-second intervals, at 11:30 A.M. the reference

```
CALL SYSTEM_CLOCK (COUNT = C, COUNT_RATE = R, COUNT_MAX = M)
```

sets  $C = 11 * 3600 + 30 * 60 = 41400$ ,  $R = 1$ , and  $M = 24 * 3600 - 1 = 86399$ .

---

## TAN(X)

---

### Description

Tangent function, which accepts the input in radians.

### Class

Elemental function.

**Argument**

x must be of type real.

**Result Type and Type Parameter**

Same as x.

**Result Value**

The result has a value equal to a processor-dependent approximation to  $\tan(x)$ , with x regarded as a value in radians.

**Examples**

TAN( 1.0 ) has the value 1.5574077.

TAN( 2.0\_HIGH ) has the value -2.1850398632615 with kind HIGH.

---

## TAND(X)

---

**Description**

Tangent function that accepts the input in degrees.

**Class**

Elemental nonstandard function.

**Argument**

x must be of type real.

**Result Type and Type Parameter**

Same as x.

**Result Value**

The result has a value equal to a processor-dependent approximation to  $\tan(x)$ .

**Examples**

`TAND( 0 . 0 )` has the value 0.0.

`TAND( 45 . 0 )` has the value 1.0.

`TAND( 135 . 0 )` has the value -1.0.

---

## TANH(X)

---

**Description**

Hyperbolic tangent function.

**Class**

Elemental function.

**Argument**

x must be of type real.

**Result Type and Type Parameter**

Same as x.

**Result Value**

The result has a value equal to a processor-dependent approximation to  $\tanh(x)$ .

**Examples**

`TANH( 1 . 0 )` has the value 0.76159416.

`TANH(2.0_HIGH)` has the value 0.96402758007582 with kind HIGH.

---

## TINY(X)

---

### Description

Returns the smallest positive number in the model representing numbers of the same type and kind type parameter as the argument.

### Class

Inquiry function.

### Argument

*X* must be of type real. It may be scalar or array valued.

### Result Type, Type Parameter, and Shape

Scalar with the same type and kind type parameter as *X*.

### Result Value

The result has the value

$b^{e_{\min}-1}$

where *b* and  $e_{\min}$  are as defined in the section “[The Real Number System Model](#)”.

### Example

`TINY(X)` has the value  $2^{-127}$  for real *x*, whose model is described in the section “[The Real Number System Model](#)”.

---

## TRANSFER(SOURCE, MOLD, SIZE)

---

### Optional Argument

SIZE

### Description

Returns a result with a physical representation identical to that of `SOURCE` but interpreted with the type and type parameters of `MOLD`.

### Class

Transformational function.

### Arguments

<code>SOURCE</code>	may be of any type and may be scalar or array valued.
<code>MOLD</code>	may be of any type and may be scalar or array valued.
<code>SIZE</code> (optional)	must be scalar and of type integer. The corresponding actual argument must not be an optional dummy argument.

### Result Type, Type Parameter, and Shape

The result is of the same type and type parameters as `MOLD`.

Case 1	If <code>MOLD</code> is a scalar and <code>SIZE</code> is absent, the result is a scalar.
Case 2	If <code>MOLD</code> is array valued and <code>SIZE</code> is absent, the result is array valued and of rank one. Its size is as small as possible such that its physical representation is not shorter than that of <code>SOURCE</code> .
Case 3	If <code>SIZE</code> is present, the result is array valued of rank one and size <code>SIZE</code> .

## Result Value

If the physical representation of the result has the same length as that of `SOURCE`, the physical representation of the result is that of `SOURCE`.

If the physical representation of the result is longer than that of `SOURCE`, the physical representation of the leading part is that of `SOURCE` and the remainder is undefined.

If the physical representation of the result is shorter than that of `SOURCE`, the physical representation of the result is the leading part of `SOURCE`. If `D` and `E` are scalar variables such that the physical representation of `D` is as long as or longer than that of `E`, the value of `TRANSFER(TRANSFER(E, D), E)` must be the value of `E`.

If `D` is an array and `E` is an array of rank one, the value of `TRANSFER(TRANSFER(E, D), E, SIZE(E))` must be the value of `E`.

## Examples

- Case 1            `TRANSFER(1082130432, 0.0)` has the value 4.0 on a processor that represents the values 4.0 and 1082130432 as the string of binary digits 0100 0000 1000 0000 0000 0000 0000 0000.
- Case 2            `TRANSFER((/ 1.1, 2.2, 3.3 /), (/ (0.0, 0.0) /))` is a complex rank-one array of length two whose first element is (1.1, 2.2) and whose second element has a real part with the value 3.3. The imaginary part of the second element is undefined.
- Case 3            `TRANSFER((/ 1.1, 2.2, 3.3 /), (/ (0.0, 0.0) /), 1)` has the value  $1.1 + 2.2i$ , which is a rank-one array with one complex element.

---

## TRANSPOSE(MATRIX)

---

### Description

Transpose an array of rank two.

### Class

Transformational function.

### Argument

`MATRIX` may be of any type and must have rank two.

Result Type, Type Parameters, and Shape. The result is an array of the same type and type parameters as `MATRIX` and with rank two and shape  $(n, m)$  where  $(m, n)$  is the shape of `MATRIX`.

### Result Value

Element  $(i, j)$  of the result has the value `MATRIX(j, i)`,  $i = 1, 2, \dots, n$ ;  $j = 1, 2, \dots, m$ .

### Example

If `A` is the array

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

then `TRANSPOSE(A)` has the value

$$\begin{bmatrix} 1 & 4 & 7 \\ 2 & 5 & 8 \\ 3 & 6 & 9 \end{bmatrix}$$



---

## TRIM(String)

---

### Description

Returns the argument with trailing blank characters removed.

### Class

Transformational function.

### Argument

String must be of type character and must be a scalar.

### Result Type and Type Parameters

Character with the same kind type parameter value as String and with a length that is the length of String less the number of trailing blanks in String.

### Result Value

The value of the result is the same as String except any trailing blanks are removed. If String contains no nonblank characters, the result has zero length.

### Example

TRIM( 'babbb' ) is 'bAbB'.

---

## UBOUND(ARRAY, DIM)

---

### Optional Argument

DIM

### Description

Returns all the upper bounds of an array or a specified upper bound.

### Class

Inquiry function.

### Arguments

ARRAY

may be of any type. It must not be scalar. It must not be a pointer that is disassociated or an allocatable array that is not allocated. If ARRAY is an assumed-size array, DIM must be present with a value less than the rank of ARRAY.

DIM (optional)

must be scalar and of type integer with a value in the range  $1 \leq \text{DIM} \leq n$ , where  $n$  is the rank of ARRAY. The corresponding actual argument must not be an optional dummy argument.

### Result Type, Type Parameter, and Shape.

The result is of type default integer. It is scalar if DIM is present; otherwise, the result is an array of rank one and size  $n$ , where  $n$  is the rank of ARRAY.

## Result Value

- Case 1 For an array section or for an array expression, other than a whole array or array structure component, `UBOUND (ARRAY, DIM)` has a value equal to the number of elements in the given dimension; otherwise, it has a value equal to the upper bound for subscript `DIM` of `ARRAY` if dimension `DIM` of `ARRAY` does not have size zero and has the value zero if dimension `DIM` has size zero.
- Case 2 `UBOUND (ARRAY)` has a value whose *i*th component is equal to `UBOUND (ARRAY, i)`, for *i* = 1, 2, ..., *n*, where *n* is the rank of `ARRAY`.

## Examples

If the following statements are processed

```
REAL, TARGET :: A (2:3, 7:10)
REAL, POINTER, DIMENSION (:,:) :: B, C, D
B => A; C => A(:, :)
ALLOCATE (D(-3:3, -7:7))
```

then

- `UBOUND (A)` is [3, 10]
- `UBOUND (A, DIM = 2)` is 10
- `UBOUND (B)` is [3, 10]
- `UBOUND (C)` is [2, 4]
- `UBOUND (D)` is [3, 7]

---

## UNPACK(VECTOR, MASK, FIELD)

---

### Description

Unpack an array of rank one into an array under the control of a mask.

### Class

Transformational function.

### Arguments

VECTOR	may be of any type. It must have rank one. Its size must be at least $t$ where $t$ is the number of <code>.TRUE.</code> elements in MASK.
MASK	must be array valued and of type logical.
FIELD	must be of the same type and type parameters as VECTOR and must be conformable with MASK.

### Result Type, Type Parameter, and Shape

The result is an array of the same type and type parameters as VECTOR and the same shape as MASK.

### Result Value

The element of the result that corresponds to the  $i$ th `.TRUE.` element of MASK, in array element order, has the value `VECTOR( $i$ )` for  $i=1, 2, \dots, t$ , where  $t$  is the number of `.TRUE.` values in MASK. Each other element has a value equal to FIELD if FIELD is scalar or to the corresponding element of FIELD if it is an array.

## Examples

Specific values may be “scattered” to specific positions in an array by using `UNPACK`. If `M` is the array

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

then `V` is the array `[1, 2, 3]`,

and `Q` is the logical mask

$$\begin{bmatrix} . & T & . \\ T & . & . \\ . & . & T \end{bmatrix}$$

where “T” represents `.TRUE.` and “.” represents `.FALSE.`, then the result of `UNPACK(V, MASK = Q, FIELD = M)` has the value

$$\begin{bmatrix} 1 & 2 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 3 \end{bmatrix}$$

and the result of `UNPACK(V, MASK = Q, FIELD = 0)` has the value

$$\begin{bmatrix} 0 & 2 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 3 \end{bmatrix}$$

---

## VERIFY(String, Set, Back)

---

### Optional Argument

BACK

### Description

Verify that a set of characters contains all the characters in a string by identifying the position of the first character in a string of characters that does not appear in a given set of characters.

### Class

Elemental function.

### Arguments

STRING	must be of type character.
SET	must be of type character with the same kind type parameter as STRING
BACK (optional)	must be of type logical.

### Result Type and Type Parameter

Default integer.

**Result Value**

- Case 1            If `BACK` is absent or present with the value `.FALSE.` and if `STRING` contains at least one character that is not in `SET`, the value of the result is the position of the leftmost character of `STRING` that is not in `SET`.
- Case 2            If `BACK` is present with the value `.TRUE.` and if `STRING` contains at least one character that is not in `SET`, the value of the result is the position of the rightmost character of `STRING` that is not in `SET`.
- Case 3            The value of the result is zero if each character in `STRING` is in `SET` or if `STRING` has zero length.

**Examples**

- Case 1            `VERIFY( 'ABBA' , 'A' )` has the value 2.
- Case 2            `VERIFY( 'ABBA' , 'A' , BACK = .TRUE. )` has the value 3.
- Case 3            `VERIFY( 'ABBA' , 'AB' )` has the value 0.

---

## XOR(I, J)

---

### Description

Bitwise exclusive OR.

### Class

Elemental nonstandard function.

### Arguments

I	must be of type integer.
J	must be of type integer with the same kind type parameter as I.

### Result Type and Type Parameter

Same as I.



---

**NOTE.** See the section “[IXOR\(I, J\)](#)” for result value information and examples.

---



# Portability Functions

---

## 2

This chapter describes the functions (in alphabetical order) that comprise the portability library (`libPEPCF90.lib`). These functions are made available to the compiler when you invoke the `/4Yportlib` (Windows\*) or `-Vaxlib` (Linux\*) option. The function prototypes are described using the `INTERFACE` block, which provide the required information to complete a call to the specified function. For descriptions of the `INTERFACE` block and the `/4Yportlib` (Windows) or `-Vaxlib` (Linux) option, see the *Intel® Fortran Compiler User's Guide*.

When using these functions, take the following considerations in mind:

- These functions are not a built-in part of the Fortran language. If you have `FUNCTION`, `SUBROUTINE`, or `COMMON` block names in your program that conflict with a particular portability function that you wish to use, you may need to change the name of the global entity in your program, in order to access the portability function.
- These functions are in user name space, and are linked only when you use the `/4Yportlib` (Windows) or `-Vaxlib` (Linux) option, and only then when there is no global definition in your program that satisfies the global reference.
- You do not have to insert a `USE` statement to interface to these functions, as with some other vendor's products. You should use an `INTERFACE` block in your program to describe the interface to the routine in the portability library that you are calling. Without an `INTERFACE` block, you may get incorrect results unless you are very careful with implicit typing. If you want to include interfaces for all the routines in your program, you can:
  - include the file `iflport.f90` from the `INCLUDE` directory of your distribution or
  - add a `USE IFLPORT` statement to access the `INTERFACES` for all portability functions.

## ACCESS

*Determines file access values*

---

### Prototype

```
USE IFLPORT
```

or

```
INTEGER(4) FUNCTION ACCESS(NAME,MODE)
    CHARACTER(LEN=*) NAME,MODE
END FUNCTION ACCESS
```

**NAME**                      Input. CHARACTER(LEN=\*) . Name of the file whose accessibility is to be determined.

**MODE**                      Input. CHARACTER(LEN=\*) . Modes of accessibility to check for. MODE is a character string of length one or greater containing only the characters "r", "w", "x", or "" (a blank). These characters are interpreted as follows:

### Character Meaning

The characters within MODE can appear in any order.

### Usage

```
result = ACCESS (filename, mode)
```

### Results

The result is INTEGER(4), and is zero if all access permissions in MODE are true. If input values that you pass to the function are invalid, or if the file cannot be accessed in all of the modes specified, one of the following error codes is returned:

EACCES	Access denied;
EINVAL	The mode argument is invalid
ENOENT	File not found

These error values are derived from the possible values of `ERRNO`, in Microsoft\* Visual C++\*.

Symbolic values for these error codes are defined in `iflport.f90`.

The *filename* argument can contain either forward or backward slashes for path separators.

On Windows\* operating systems, all files are readable. A test for read permission always returns 0.

### Example

```
OPEN(UNIT=1,FILE="IFLFILE.TXT",STATUS='UNKNOWN')
WRITE (1,10) "THIS IS A TEST"
CLOSE(UNIT=1)
! checks for read and write permission on the file
"IFLFILE.TXT"

J = ACCESS ("IFLFILE.TXT", "rw")
PRINT *, J
! checks whether "IFLFILE.TXT" is executable. It is
not, since
! it does not end in .COM, .EXE, .BAT, or .CMD
J = ACCESS ("IFLFILE.TXT","x")
PRINT *, J
10 FORMAT(A)
END
```

---

## BEEPQQ

*Invokes the speaker*

---

### Prototype

USE IFLPORT

or

```

INTERFACE
  SUBROUTINE BEEPQQ(FREQ,DUR)
    INTEGER(4) FREQ, DUR
  END SUBROUTINE
END INTERFACE

```

## Description

Invokes the speaker at the specified frequency for the specified duration in milliseconds.

## Usage

```

CALL BEEPQQ (FREQ, DUR)

```

FREQ                    INTEGER(4). Frequency of the tone

DUR                    Length of the tone in milliseconds.

BEEPQQ                does not return until the sound terminates.

## Example

```

USE IFLPORT
INTEGER(4) FREQ, DUR
FREQ = 4000
DUR = 1000
CALL BEEPQQ(FREQ, DUR)
END

```

---

## BESJ0, BESJ1, BESJN, BESY0, BESY1, BESYN

*Compute the single-precision values of  
Bessel functions*

---

## Prototype

```

USE IFLPORT
or

```

```
INTERFACE
    REAL(4) FUNCTION BESJ0(X)
    REAL(4) X
    END FUNCTION

    REAL(4) FUNCTION BESJ1(X)
    REAL(4) X
    END FUNCTION

    REAL(4) FUNCTION BESJN(N,X)
    INTEGER(4) N
    REAL(4) X
    END FUNCTION

    REAL(4) FUNCTION BESY0(X)
    REAL(4) X
    END FUNCTION

    REAL(4) FUNCTION BESY1(X)
    REAL(4) X
    END FUNCTION

    REAL(4) FUNCTION BESYN(N,X)
    INTEGER(4) N
    REAL(4) X
    END FUNCTION
END INTERFACE
```

### Description

Compute the single-precision values of Bessel functions of the first and second kinds.

### Usage

```
result = BESJ0 (REALPOSITIVE)
result = BESJ1 (REALPOSITIVE)
```

```
result = BESJN (n, REALPOSITIVE)
result = BESY0 (REALPOSITIVE)
result = BESY1 (REALPOSITIVE)
result = BESYN (n, REALPOSITIVE)
```

**REALPOSITIVE**    `REAL(4)`. Independent variable for a Bessel function.  
Must be greater than or equal to zero.

**N**    `INTEGER(4)` unless changed by the user. Specifies the order of the selected Bessel function computation.

## Results

BESJ0, BESJ1, and BESJN return Bessel functions of the first kind, orders 0, 1, and *n*, respectively, with the independent variable `REALPOSITIVE`.

BESY0, BESY1, and BESYN return Bessel functions of the second kind, orders 0, 1, and *n*, respectively, with the independent variable `REALPOSITIVE`.

Negative arguments return `QNAN`.

---

## CDFLOAT

*Converts an `COMPLEX(4)` to a  
`DOUBLE PRECISION` type*

---

### Prototype

```
INTERFACE
  DOUBLE PRECISION (REAL(8)) FUNCTION CDFLOAT (INPUT)
    COMPLEX(4), INTENT(IN)::INPUT
  END FUNCTION CDFLOAT
END INTERFACE
```

**INPUT**    a `COMPLEX (KIND=4)` value

**Description**

CDFLOAT is an elemental function that converts a COMPLEX (KIND=4) type to DOUBLE PRECISION (REAL(8)).

**Output**

The COMPLEX value converted to DOUBLE PRECISION.

---

## CHANGEDIRQQ

*Sets specified directory to the current directory*

---

**Prototype**

```
USE IFLPORT

or

INTERFACE
    LOGICAL(4) FUNCTION CHANGEDIRQQ(DIR)
        CHARACTER(LEN=*) DIR
    END FUNCTION
END INTERFACE
```

**Description**

Sets the specified directory to the current, default directory.

**Usage**

```
result = CHANGEDIRQQ (DIR)

DIR          CHARACTER(LEN=*) . Directory to be made the current
              directory.
```

**Results**

LOGICAL(4) . . TRUE . if successful; otherwise, . FALSE .

If you do not specify a drive in the `DIR` string, the named directory on the current drive becomes the current directory. If you specify a drive in `DIR`, the named directory on the specified drive becomes the current directory.

### Example

```
USE IFLPORT
LOGICAL(4) CHANGEDIT
CHANGEDIT = CHANGEDIRQQ('c:\users')
END
```

---

## CHANGEDRIVEQQ

*Sets default drive*

---

### Prototype

```
USE IFLPORT
or
INTERFACE
    LOGICAL(4) FUNCTION CHANGEDRIVEQQ(DriveName)
        CHARACTER (LEN=*) DriveName
    END FUNCTION
END INTERFACE
```

### Description

Sets the specified drive to the current, default drive.

### Usage

```
result = CHANGEDRIVEQQ (DriveName)
```

`DriveName`      `CHARACTER (LEN=*)`. CHARACTER value beginning with the drive letter.



## Results

The result type is LOGICAL( 4 ). The result is .TRUE. if successful; otherwise, .FALSE..

Drives are identified by a single alphabetic character. CHANGEDRIVEQQ examines only the first character of DriveName. The drive letter can be uppercase or lowercase.

CHANGEDRIVEQQ changes only the current drive. The current directory on the specified drive becomes the new current directory. If no current directory has been established on that drive, the root directory of the specified drive becomes the new current directory.

**On Linux platforms**, this routine always returns .false..

## Example

```
USE IFLPORT
LOGICAL(4) CHANGEDIT
CHANGEDIT = CHANGEDRIVEQQ('d')
IF (CHANGEDIT) THEN
    PRINT *, "CHANGEDRIVEQQ SUCCESSFUL"
ELSE
    PRINT *, "Drive could not be changed"
ENDIF
END
```

---

# CHDIR

*Changes the default directory.*

---

## Prototype

```
USE IFLPORT
Or
INTERFACE
```

```

INTEGER(4) FUNCTION CHDIR(DIRECTORY_NAME)
    CHARACTER(LEN=*) DIRECTORY_NAME
END FUNCTION CHDIR
END INTERFACE

```

## Usage

```
result = CHDIR(NEW_DIRECTORY)
```

NEW\_DIRECTORY CHARACTER(LEN=\*) . Name of directory to become the default directory.

## Results

The result type is INTEGER(4). CHDIR returns zero if the directory was changed successfully; otherwise, an error code. Possible error codes are:

ENOENT	The named directory does not exist.
ENOTDIR	The NEW_DIRECTORY parameter is not a directory.

## Example

```

USE IFLPORT
CHARACTER(LEN=16) NEW_DIRECTORY
LOGICAL(4) CHANGEDIT
NEW_DIRECTORY="c:\program files"
CHANGEDIT=CHDIR(NEW_DIRECTORY)
IF (CHANGEDIT) THEN
    PRINT *, "CHDIR SUCCESSFUL"
ELSE
    PRINT *, "Directory could not be changed"
ENDIF
END

```

---

## CLEARSTATUSFPQQ

*Clears floating point processor status word.*

---

### Prototype

```
INTERFACE
    SUBROUTINE CLEARSTATUSFPQQ ( )
    END SUBROUTINE
END INTERFACE
```

### Description

Clear floating point processor status word.

---

## CLOCK

*Returns current time*

---

### Prototype

```
INTERFACE
    CHARACTER (LEN=8) FUNCTION CLOCK ( )
    END FUNCTION
END INTERFACE
```

### Description

Returns the current time of the day in the form HH:MM:SS using a 24-hour clock.

### Output

The current time in the form of hh:mm:ss, .

---

## CLOCKX

*Returns processor clock*

---

### Prototype

```
INTERFACE
  SUBROUTINE CLOCKX (CLOCK)
    REAL(8) CLOCK
  END SUBROUTINE CLOCKX
END INTERFACE
```

CLOCK            current time

### Description

This function returns the processor clock to the nearest microsecond.

### Output

Processor clock to the nearest microsecond.

---

## COMMITQQ

*Forces execution of any pending write operation(s)*

---

### Prototype

```
USE IFLPORT
```

Or

```
INTERFACE
  LOGICAL(4) FUNCTION COMMITQQ(LUN)
    INTEGER(4) LUN
  END FUNCTION COMMITQQ
END INTERFACE
```

```

        END FUNCTION COMMITQQ
END INTERFACE

```

## Description

Forces the operating system to execute any pending write operation(s) for the file associated with a specified unit to the file's physical device. Same functionality as `FLUSH`.

## Usage

```
result = COMMITQQ (LUN)
```

**LUN**                      Input. `INTEGER(4)`. Fortran logical unit (`LUN`) attached to a file to be flushed from cache memory to a physical device.

## Results

The result type is `LOGICAL(4)`. If an open `LUN` number is supplied, `.TRUE.` is returned and uncommitted records (if any) are written. If an unopened `LUN` is supplied, `.FALSE.` is returned.

Data written to files is often written into buffers, and held until the buffer is full. Only when the buffer is full, is the data written to the device. Data in the buffer is automatically flushed to disk when the file is closed. However, if the program or the computer crashes before the data is transferred from buffers, the data can be lost.

`COMMITQQ` forces any cached data intended for a file on a physical device to be written to that device immediately. This is called flushing the file.




---

**NOTE.** *Copy the file `iflport.f90` from the distribution list into a local directory and compile it before USE.*

---

## Example

```

USE IFLPORT
INTEGER LUN / 10 /
INTEGER len
CHARACTER(80) stuff

```

```

OPEN(LUN, FILE='COMMITQQ.TST', ACCESS='Sequential')
DO WHILE (.TRUE.)
  WRITE (*, '(A, \)') 'Enter some data (Hit RETURN to
exit): '
  len = GETSTRQQ (stuff)
  IF (len .EQ. 0) EXIT
  WRITE (LUN, *) stuff
  IF (.NOT. COMMITQQ(LUN)) WRITE (*,*) 'Failed'
END DO
CLOSE (LUN)
END

```

---

## COMPL

*Returns a BIT-WISE Complement or  
logical .NOT. of the input value*

---

### Prototype

```

INTERFACE COMPL
  INTEGER(4) FUNCTION COMPLINT(INVAL)
    INTEGER(4), INTENT(IN) :: INVAL
  END FUNCTION
  REAL(4) FUNCTION COMPLREAL(INVAL)
    REAL(4), INTENT(IN) :: INVAL
  END FUNCTION
  LOGICAL(4) FUNCTION COMPLLOG(INVAL)
    LOGICAL(4), INTENT(IN) :: INVAL
  END FUNCTION
END INTERFACE

```

INVAL                    Input. INTEGER(4), REAL(4) or LOGICAL(4) for  
each of the above functins, respectively.

**Description**

Performs a BIT-WISE complement for INTEGER or REAL input or logical .NOT. for logical input.

**Output**

If the input is logical, the result is logical. Otherwise, the result is Boolean - a Cray bitset. With a Boolean result, use a BIT-WISE complement. For the logical COMPL, just toggle 1<-->0.

---

**CTIME**

*Converts a given time into a  
24- character ASCII string*

---

**Prototype****IA-32 systems**

```
INTERFACE
  CHARACTER(LEN=24) FUNCTION CTIME(TIME)
  INTEGER(4) INTENT(IN) :: TIME
  END FUNCTION CTIME
END INTERFACE
```

**Itanium™-based systems**

```
INTERFACE
  CHARACTER(LEN=24) FUNCTION CTIME(TIME)
  INTEGER(8) INTENT(IN) :: TIME
  END FUNCTION CTIME
END INTERFACE
```

TIME                    elapsed time in seconds since 00:00:00 Greenwich  
                         Mean Time, January 1, 1970.

## Description

This function takes an INTEGER(4) for IA-32 or INTEGER(8) for Itanium based systems variable or expression as input. The input value is some number of seconds since midnight of January 1, 1970, in Greenwich Mean Time. CTIME converts this integer input value into an ASCII character string.

## Output

A 24-character ASCII string in the form: Thu Jan 15 00:00:01 1970.

---

## DATE

*Returns the current date and time as  
ASCII string*

---

```
INTERFACE
  SUBROUTINE DATE (DATESTR)
    CHARACTER (LEN=9) DATESTR
  END SUBROUTINE DATE
END INTERFACE
```

## Description

This function returns the current date and time as a nine character ASCII string.

## Output

A 9-character ASCII string in the form: dd-mm-yy where:

dd	is the 2-digit date
mm	is the 3 letter month
yy	is the last two digits of the year





---

**WARNING.** *This routine may cause problems with the year 2000. Use `DATE_AND_TIME` or `DATE4` instead.*

---

### Example

The following program gets and prints the current system date. Its output could be, for example, “12-Jul-96” (without the quotes).

```
PROGRAM datetest
  CHARACTER(9) :: today
  INTRINSIC DATE
  CALL DATE(today)
  PRINT *, today
END
```

---

## DATE4

*Returns the current date and time as  
ASCII string*

---

### Prototype

```
INTERFACE
  SUBROUTINE DATE4( DATESTR )
    CHARACTER(LEN=11) DATESTR
  END SUBROUTINE DATE4
END INTERFACE
```

### Description

This function returns the current date and time as an eleven character ASCII string.

## Output

An 11-character ASCII string in the form: dd-mmm-yyyy where:

dd	is the 2-digit date
mmm	is the 3 letter month
yy	is the last two digits of the year




---

**NOTE.** *Although using DATE\_AND\_TIME is better, since it is now standard in the Fortran language, this routine gives you the functionality of the old DATE routine and is year-2000 compliant.*

---



---

## DBESJ0, DBESJ1, DBESJN, DBESY0, DBESY1, DBESYN

*Compute the double-precision numbers of Bessel functions.*

---

## Prototype

```
USE IFLPORT or
INTERFACE
    REAL(8) FUNCTION DBESJ0(X)
    REAL(8) X
    END FUNCTION
    REAL(8) FUNCTION DBESJ1(X)
    REAL(8) X
    END FUNCTION

    REAL(8) FUNCTION DBESJN(N,X)
    INTEGER(4) N
```

```

REAL(8) X
END FUNCTION

REAL(8) FUNCTION DBESY0(X)
REAL(8) X
END FUNCTION

REAL(8) FUNCTION DBESY1(X)
REAL(8) X
END FUNCTION

REAL(8) FUNCTION DBESYN(N,X)
INTEGER(4) N
REAL(8) X
END FUNCTION
END INTERFACE

```

## Descriptions

Compute the double-precision values of Bessel functions of the first and second kinds.

## Usage

```

result = DBESJ0 (DOUBLEPOS)
result = DBESJ1 (DOUBLEPOS)
result = DBESJN (n, DOUBLEPOS)
result = DBESY0 (DOUBLEPOS)
result = DBESY1 (DOUBLEPOS)
result = DBESYN (n, DOUBLEPOS)

```

DOUBLEPOS      REAL(8). Independent variable for a Bessel function.  
Must be greater than or equal to zero.

N                Integer. Specifies the order of the selected Bessel  
function computation.

## Results

DBESJ0, DBESJ1, and DBESJN return Bessel functions of the first kind, orders 0, 1, and  $n$ , respectively, with the independent variable DOUBLEPOSE.

DBESY0, DBESY1, and DBESYN return Bessel functions of the second kind, orders 0, 1, and  $n$ , respectively, with the independent variable DOUBLEPOSE.

Negative arguments cause DBESY0, DBESY1, and DBESYN to return a huge negative value.

## Example

```
      USE IFLPORT
      REAL(8) BESNUM, BESOUT
10    READ *, BESNUM
      BESOUT = DBESJ0(BESNUM)
      PRINT *, 'Result is ',BESOUT
      GOTO 10
      END
```

---

## DCLOCK

*Provides elapsed time in seconds since the start of the current process.*

---

## Prototype

```
INTERFACE
    REAL(8) FUNCTION DCLOCK()
END FUNCTION
END INTERFACE
```

**Description**

This function returns the elapsed time since the start of your process as a `DOUBLE PRECISION` number.

**Note:** The first call to `DCLOCK` performs calibration.

**Class**

Elemental nonstandard function.

**Result Type and Type Parameter**

`DOUBLE PRECISION`

**Output**

The time in seconds since the beginning of your process. This routine provides accurate timing to the nearest microsecond, taking into account the frequency of the processor where the current process is running. You can obtain equivalent results using standard Fortran by using the `CPU_TIME` intrinsic function.

**Examples**

```
DOUBLE PRECISION START_TIME, STOP_TIME, DCLOCK
EXTERNAL DCLOCK
START_CLOCK = DCLOCK()
CALL FOO()
STOP_CLOCK = DCLOCK()
PRINT *, "foo took:", STOP_CLOCK - START_CLOCK, "seconds."
```

---

**DELDIRQQ**

*Deletes a specified directory*

---

**Prototype**

```
USE IFLPORT
or
```

```

INTERFACE
  LOGICAL(4) FUNCTION DELDIRQQ(DirName)
    CHARACTER(LEN=*) DirName
  END FUNCTION
END INTERFACE

```

## Usage

```
result = DELDIRQQ (DIRNAME)
```

DIRNAME CHARACTER(LEN=\*) . CHARACTER value containing the name of the directory to be deleted.

## Results

The result is LOGICAL(4) . The result is .TRUE. if successful; otherwise, .FALSE. .

The directory to be deleted must be empty. It cannot be the current directory, the root directory, or a directory currently in use by another process.

---

## DELFILESQQ

*Deletes files matching specification*

---

## Prototype

```
USE IFLPORT
```

or

```

INTERFACE
  INTEGER(4) FUNCTION DELFILESQQ(FILESPEC)
    CHARACTER(LEN=*) FILESPEC
  END FUNCTION
END INTERFACE

```

## Description

Deletes all files matching the name specification, which can contain wildcards (\* and ?).

## Usage

```
result = DELFILESQQ (FILESPEC)
```

FILESPEC            CHARACTER (LEN=\*) . File(s) to be deleted. Can contain wildcards (\* and ?).

## Results

The result type is INTEGER ( 2 ). The return value is the number of files deleted.

You can use wildcards to delete more than one file at a time. DELFILESQQ does not delete directories or system, hidden, or read-only files. Use this function with caution because it can delete many files at once. If a file is in use by another process (for example, if it is open in another process), it cannot be deleted.

## Example

```
USE IFLPORT
INTEGER(4) len, count
CHARACTER(80) file
CHARACTER(1) ch
WRITE(*,*) "Enter names of files to delete: "
len = GETSTRQQ(file)
IF (file(1:len) .EQ. '*.*') THEN
    WRITE(*,*) "Are you sure (Y/N)?"
    ch = GETCHARQQ()
    IF ((ch .NE. 'Y') .AND. (ch .NE. 'y')) THEN
        STOP "No files deleted"
    ELSE
        PRINT *, "OK, deleting all files"
    ENDIF
END IF
count = DELFILESQQ(file)
```

```
WRITE(*,*) "Deleted ", count, " files."  
END
```

---

## DFLOATI

*Converts an INTEGER(2) to a DOUBLE  
PRECISION type*

---

### Prototype

```
INTERFACE  
  DOUBLE PRECISION (REAL(8)) FUNCTION DFLOATI (INPUT)  
    INTEGER(2), INTENT(IN)::INPUT  
  END FUNCTION DFLOATI  
END INTERFACE
```

INPUT                    a scalar INTEGER (KIND=2) value

### Description

DFLOATI is an elemental function that converts a scalar integer (KIND=2) type to DOUBLE PRECISION (REAL(8)).

### Output

The integer value converted to DOUBLE PRECISION.



---

## DFLOATJ

*Converts an INTEGER(4) to a DOUBLE PRECISION type*

---

### Prototype

```
INTERFACE
  DOUBLE PRECISION (REAL(8)) FUNCTION DFLOATJ (INPUT)
    INTEGER(4), INTENT(IN)::INPUT
  END FUNCTION DFLOATJ
END INTERFACE

INPUT          an INTEGER(4) value or expression
```

### Description

DFLOATJ is an elemental function that converts an INTEGER(4) type to DOUBLE PRECISION (REAL(8)) type.

### Output

The integer value converted to DOUBLE PRECISION.

---

## DFLOATK

*Converts an INTEGER(8) type to a DOUBLE PRECISION type*

---

### Prototype

```
INTERFACE
  REAL(8) FUNCTION DFLOATK (INPUT)
    INTEGER(8), INTENT(IN)::INPUT
  END FUNCTION DFLOATJ
END INTERFACE
```

END INTERFACE

INPUT                    an INTEGER ( 8 ) value or expression.

## Description

DFLOATK is an elemental function that converts an INTEGER ( 8 ) type to a DOUBLE PRECISION (or REAL ( 8 ) ) type.

## Output

The integer value converted to DOUBLE PRECISION.

---

# DRAND

*Generates successive pseudorandom numbers in the range of 0. to 1.*

---

## Prototype

```
INTERFACE
    REAL( 8 ) FUNCTION DRAND ( )
    END FUNCTION DRAND
END INTERFACE
```

## Description

Generate successive pseudorandom numbers uniformly distributed in the range of 0.0 to 1.0.

## Class

Elemental nonstandard function.

## Result Type and Type Parameter

REAL ( 8 ) type.

**Example**

```
REAL(8) rv  
rv = RAND()
```



---

**NOTE.** *For details about restarting the pseudorandom number generator used by IRAND and RAND, see the “SRAND” section.*

---

---

## DRANSET

*Sets the seed for RANGET*

---

**Prototype**

```
INTERFACE  
  SUBROUTINE DRANSET (ISEED)  
    REAL(8) ISEED  
  END SUBROUTINE DRANSET  
END INTERFACE
```

**Description**

Allows you to set the seed for RANGET, changing the sequence of pseudo-random numbers.

**Output**

Changes the internal value of the random number generator seed for RANGET.

## DSHIFTL

*Double shift left*

---

### Prototype

```
INTERFACE
  INTEGER(8) FUNCTION DSHIFTL (LEFT, RIGHT, SHIFT)
    INTEGER(8) LEFT, RIGHT, SHIFT
  END FUNCTION DSHIFTL
END INTERFACE
```

LEFT            a 64-bit integer expression.  
 RIGHT          a 64-bit integer expression.  
 SHIFT          shift count.

### Description

This function takes two 64-bit values and a shift count, and returns a 64-bit value comprised of the 64 bits starting at 64-SHIFT in left continuing through to right.

### Example

```
INTERFACE
  INTEGER(8) FUNCTION DSHIFTL(LEFT,RIGHT,SHIFT)
    INTEGER(8) LEFT,RIGHT,SHIFT
  END FUNCTION DSHIFTL
END INTERFACE

INTEGER(8) LEFT/Z'111122221111222'/
INTEGER(8) RIGHT/Z'FFFFFFFFFFFF'/
PRINT *, DSHIFTL(LEFT, RIGHT,16_8)

END
```

The correct output for this example is: 1306643199093243919.

## Output

This function performs a shift left and extract, for compatibility with CRAY Fortran code.

---

# DSHIFTR

*Double shift right*

---

## Prototype

```
INTERFACE
    INTEGER(8) FUNCTION DSHIFTR(LEFT,RIGHT,SHIFT)
        INTEGER(8) LEFT,RIGHT,SHIFT
    END FUNCTION DSHIFTR
END INTERFACE
```

ILEFT            a 64-bit integer value.  
IRIGHT          a 64-bit integer value.  
ISHIFT          an integer shift count.

## Description

Interprets ILEFT and IRIGHT as the upper and lower parts, respectively, of a 128-bit integer. The result is the 64-bit string beginning with the bit ISHIFT of the 128-bit integer. The arguments, ILEFT and IRIGHT, are not altered unless the function result is assigned to the same storage location as either ILEFT or IRIGHT. ISHIFT should be in the range 0 to 64, inclusive.

## Example

```
INTERFACE
    INTEGER(8) FUNCTION
DSHIFTR(LEFT,RIGHT,SHIFT)
        INTEGER(8) LEFT,RIGHT,SHIFT
    END FUNCTION DSHIFTR
END INTERFACE
    INTEGER(8) LEFT/Z'111122221111222'/
```

```
INTEGER(8) RIGHT/Z'FFFFFFFFFFFFFF' /  
PRINT *, DSHIFTR(LEFT, RIGHT,16_8)  
END
```

The correct output for this example is: 1306606910610341887.

## Output

A single `INTEGER(8)` value.

---

## DTIME

*Returns the elapsed CPU time since the start of execution or the last call to DTIME.*

---

## Prototype

```
INTERFACE  
  REAL(4) FUNCTION DTIME (TARRAY)  
    REAL(4) TARRAY(2)  
  END FUNCTION DTIME  
END INTERFACE
```

## Description

On the first call during the execution of a program, `DTIME` returns the time since the beginning of the program execution in the elements of `TARRAY`.

`TARRAY(1)` contains the user time, and `TARRAY(2)` contains the system time. The library routine makes use of the `GetProcessTimes` system library call. Subsequent calls to `DTIME` return the elapsed user and system time in `TARRAY` since the last call to `DTIME`.

## Output

The function returns -1 for an error. The times are returned as elements of TARRAY, as described above. Times are in seconds. For the most accurate timing of your process, use the standard Fortran 95 intrinsic CPU\_TIME.

---

# ETIME

*Returns the elapsed time in seconds  
since the start of execution*

---

## Prototype

```
INTERFACE
    REAL(4) FUNCTION ETIME(TARRAY)
    REAL(4) TARRAY(2)
    END FUNCTION
END INTERFACE
```

## Description

This function returns the elapsed time in seconds since the beginning of execution of the current process. The accuracy of ETIME is limited to the accuracy of the GetProcessTimes system call, approximately 1/100th of a second. For the most accurate timing of your routine, use the Fortran 95 standard intrinsic CPU\_TIME.

## Output

The function returns -1 in case of an error. TARRAY(1) contains the user time in seconds since the start of the process. The system time in seconds since the start of the process is returned in TARRAY(2).

---

## EXIT

*Closes all files and terminates the program*

---

### Prototype

```
INTERFACE
  SUBROUTINE EXIT (STATUS)
    INTEGER(4), OPTIONAL, INTENT(IN)::STATUS
  END SUBROUTINE
END INTERFACE
```

### Optional Argument

STATUS

### Description

Close all files and terminate the program.

### Class

Nonstandard subroutine.

### Argument

If STATUS is supplied, the calling program exits with a return code status of STATUS. Otherwise the return code status is indeterminate.

In csh the \$status environment variable holds the return code for the last executed command. In ksh, the \$? environment variable holds the return code.

### Example

The following program exits before the second PRINT statement.

```
PROGRAM testexit
  INTEGER stat
  PRINT *, "Program prints this line."
```



```
stat = 3
CALL EXIT(stat)
END
```

This program produces the following output:

Program prints this line.

The return code is saved in the `$status` or `$?` environment variable; it is not printed.

---

## FDATE

*Returns the current date and time*

---

### Prototype

```
INTERFACE
  SUBROUTINE FDATE (STRING)
    CHARACTER (LEN=24) STRING
  END SUBROUTINE FDATE
END INTERFACE
```

STRING            a 24-byte character variable or array element in which the result of FDATE is stored.

### Description

This routine returns the current date and time in STRING. Any value in STRING before the call is destroyed.

### Output

A 24-character string with the form: Thu Jan 15 00:00:01 1970.

---

## FGETC

*Reads one byte from a file*

---

### Prototype

```
INTERFACE
    INTEGER FUNCTION FGETC(LUNIT,NCHAR)
    INTEGER LUNIT
    CHARACTER(LEN=1) NCHAR
    END FUNCTION FGETC
END INTERFACE
```

LUNIT            a logical unit number

NCHAR            a character variable

### Description

This routine reads one byte from a file at its current position. If there is an error during the read, the I/O error number is returned. Otherwise, for a successful read, FGETC returns zero. You should be aware that for unformatted files, special bytes such as a record length indicator are present on each record, and may require special handling when using this function. In general, record length indicators for unformatted files are the first four bytes of each record. The logical unit number must be in the range from 0 to 100, and must be currently connected to a file when FGETC is called.

This routine is thread-safe, and locks the associated stream before I/O is performed.

### Output

A zero status is returned if successful, non-zero if failure. NCHAR is assigned the next sequential byte that would be read from the file connected to LUNIT.

---

## FINDFILEQQ

*Searches for a specified file*

---

### Prototype

```
USE IFLPORT
Or
INTERFACE
  IINTEGER(4) FUNCTION FINDFILEQQ(FILE, ENV, BUF)
    CHARACTER(LEN=*) FILE, ENV, BUF
  END FUNCTION
END INTERFACE
```

### Description

Searches for a specified file in the directories listed in the path contained in the environment variable.

### Usage

```
result = FINDFILEQQ (file, env, buf)

FILE          CHARACTER(LEN=*) . Name of the file to be found.
ENV           CHARACTER(LEN=*) . Name of an environment
              variable containing the path to be searched.
BUF           CHARACTER(LEN=*) . Buffer to receive the full path of
              the file found.
```

### Results

The result type is INTEGER(4). The result is the length of the characters containing the full path of the found file returned in BUF, or 0 if no file is found.

### Example

```
USE IFLPORT
CHARACTER(256) BUF
```

```
CHARACTER(20) FILE,ENV
INTEGER(4) result
FILE = "libc.lib"
ENV = "LIB"
result = FINDFILEQQ(FILE,ENV, buf)
WRITE (*,*) BUF
END
```

---

## FLUSH

*Flushes contents of file buffer to an external file*

---

### Prototype

```
INTERFACE
    SUBROUTINE FLUSH(LUNIT)
        INTEGER LUNIT
    END SUBROUTINE FLUSH
END INTERFACE
```

LUNIT            a logical unit number

### Description

This routine flushes the contents of the file buffer to the external file, forcing an immediate write. This is most useful for files that are connected to a terminal. The logical unit number must be in the range from 0 to 100, and must be currently connected to a file when flush is called. This routine is thread-safe, and locks the associated stream before I/O is performed.

### Output

ERRNO is set on failure.

---

## FOR\_CHECK\_FLAWED\_PENTIUM

*Checks the processor*

---

### Prototype

```
USE IFLPORT  
  
or  
  
INTERFACE  
  SUBROUTINE FOR_CHECK_FLAWED_PENTIUM  
  END SUBROUTINE  
END INTERFACE
```

### Description

Checks the processor to determine if it shows characteristics of the Pentium® floating-point divide flaw.

It is invoked for a Fortran program if you compile with the /Qfdiv compiler switch.

### Usage

```
result = FOR_CHECK_FLAWED_PENTIUM ( )
```

### Results

If the floating-point divide flaw is found, an error message is displayed and the calling program is terminated.

You can bypass this action by setting environment variable FOR\_RUN\_FLAWED\_PENTIUM to the value of .TRUE..

### Example

```
USE IFLPORT  
REAL*8 X, Y, Z  
X = 5244795.0  
Y = 3932159.0
```

```
Z = X - (X/Y) * Y
IF (Z .NE. 0) THEN           ! If flawed, Z will be 256
    PRINT *, " FDIV flaw detected on Pentium"
ENDIF
END
```

---

## FOR\_GET\_FPE

*Retrun the current settings of the  
floating-point exception flags*

---

### Prototype

```
USE IFLPORT
or
INTERFACE
    INTEGER(4) FUNCTION FOR_GET_FPE()
    END FUNCTION
END INTERFACE
```

### Description

Returns the current settings of floating-point exception flags. This routine can be called from a C or Fortran program.

### Usage

```
result = FOR_GET_FPE ( )
```

### Results

The result type is `INTEGER(4)`. The return value represents the settings of the current processor floating-point exception flags. The meanings of the bits are defined in the `IFLPORT` module file.

**Example**

```
USE IFLPORT
INTEGER(4) FPE_FLAGS
FPE_FLAGS = FOR_GET_FPE ( )
END
```

---

## FPUTC

*Writes a character a a file*

---

**Prototype**

```
INTERFACE
    INTEGER FUNCTION FPUTC(LUNIT, CH)
    INTEGER LUNIT
    CHARACTER(LEN=1) CH
    END FUNCTION FPUTC
END INTERFACE
```

LUNIT            unit number of a file.  
CH                a character variable.

**Description**

Writes a character to the file specified by the Fortran external unit.

**Output**

Zero if successful. Otherwise, an error code is returned.

## FSEEK

*Positions a file from a specified seek point*

---

### Prototype

```
INTERFACE
```

```
  SUBROUTINE FSEEK ( LUNIT , OFFSET , FROM )
```

```
    INTEGER ( 4 ) LUNIT , OFFSET , FROM
```

```
  END SUBROUTINE FSEEK
```

```
END INTERFACE
```

LUNIT	a logical unit number.						
OFFSET	an integer expression, whose value denotes an offset in bytes from the seek point FROM.						
FROM	an integer expression, whose value must be 0, 1, or 2. <table> <tr> <td>0</td><td>means the seek point is at the beginning of the file.</td></tr> <tr> <td>1</td><td>means the seek point is on the current file position.</td></tr> <tr> <td>2</td><td>means the seek point is at the end of the file.</td></tr> </table>	0	means the seek point is at the beginning of the file.	1	means the seek point is on the current file position.	2	means the seek point is at the end of the file.
0	means the seek point is at the beginning of the file.						
1	means the seek point is on the current file position.						
2	means the seek point is at the end of the file.						

### Description

This routine positions a file `OFFSET` bytes from the seek point given by the `FROM` parameter. You should be aware that for unformatted files, special bytes such as a record length indicator are present on each record, and may require special handling when using this function. In general, record length indicators for unformatted files are the first four bytes of each record. The logical unit number must be in the range from 0 to 100, and must be currently connected to a file when `fseek` is called.

This routine is thread-safe, and locks the associated stream before I/O is performed.



**Output**

A zero status is returned if successful; non-zero for failure.

---

**FOR\_SET\_FPE**

*Sets the floating-point exception flags.*

---

**Prototype**

```
USE IFLPORT
```

or

```
INTERFACE
```

```
  INTEGER(4) FUNCTION FOR_SET_FPE(EnableMask)
```

```
    INTEGER(4) EnableMask
```

```
  END FUNCTION
```

```
END INTERFACE
```

**Usage**

```
result = FOR_SET_FPE(EnableMask)
```

`EnableMask`      Must be of type `INTEGER(4)`. It contains bit flags controlling floating-point exceptions.

**Results**

The result type is `INTEGER(4)`. The return value represents the previous settings of the floating-point exception flags. The meanings of the bits are defined in the `IFLPORT.f90` module file.

**Example**

```
USE IFLPORT
```

```
INTEGER(4) OLD_FLAGS, NEW_FLAGS
```

```
OLD_FLAGS = FOR_SET_FPE (NEW_FLAGS)
```

```
END
```

## FOR\_SET\_REENTRANCY

*Controls the type of reentrancy locks on the runtime library.*

---

### Prototype

```
USE IFLPORT
or
INTERFACE
    INTEGER(4) FUNCTION FORr_SET_REENTRANCY(NEW_MODE)
        INTEGER(4) NEW_MODE
    END FUNCTION
END INTERFACE
```

### Usage

```
result = FOR_SET_REENTRANCY ( NEW_MODE )
```

NEW\_MODE          INTEGER( 4 ). Contains one of the following options:

FOR\_K\_REENTRANCY\_NONE

Tells the runtime to do simple locking around critical sections of RTL code. You should use this type of protection when the Fortran libraries will *not* be reentered due to asynchronous system traps (ASTs) or threads within the application.

FOR\_K\_REENTRANCY\_ASYNC

Tells the runtime to perform simple locking and disables ASTs around critical sections of library code. You should use this type of protection when the application contains AST handlers that call the Fortran runtime system.

FOR\_K\_REENTRANCY\_THREADED

Tells the runtime to perform thread locking. You should use this type of protection in multithreaded applications.

## FOR\_K\_REENTRANCY\_INFO

Queries the FORTRAN runtime system for the current level of reentrancy protection, and returns the result in `NEW_MODE`.

### Results

`FOR_SET_REENTRANCY` returns `INTEGER(4)`. The return value tells you the previous setting of reentrancy `NEW_MODE`, unless the argument is `FOR_K_REENTRANCY_INFO`, in which case the return value represents the current setting.

You must link to a set of runtime libraries that support the level of reentrancy you desire. For example, `FOR_SET_REENTRANCY` ignores a request for thread protection (`FOR_K_REENTRANCY_THREADED`) if you do not compile your program with `/MT`.

### Example

```
PROGRAM SETREENT
  USE IFLPORT
  INTEGER(4) MODE
  CHARACTER*10 REENT_TXT(3) / 'NONE ', 'ASYNCH ',
                               'THREADED' /

  INTEGER(4) P1, P2
  P1 = FOR_K_REENTRANCY_NONE
  P2 = FOR_K_REENTRANCY_INFO
  PRINT*, 'Setting Reentrancy mode to '
           , REENT_TXT(MODE+1) '
  MODE = FOR_SET_REENTRANCY(P1)
  PRINT*, 'Previous Reentrancy mode was '
           , REENT_TXT(MODE+1)
  MODE = FOR_SET_REENTRANCY(P2)
  PRINT*, 'Current Reentrancy mode is '
           , REENT_TXT(MODE+1)
END
```

---

## FTELL

*Returns the file position of a file*

---

### Prototype

```
INTERFACE
    INTEGER(4) FUNCTION FTELL(LUNIT)
    END FUNCTION FTELL
END INTERFACE
```

LUNIT                    a logical unit number

### Description

This routine returns the file position of the file connected to the input logical unit. The file position is the number of bytes from the beginning of the file.

You should be aware that for unformatted files, special bytes such as a record length indicator are present on each record, and are counted when using this function. In general, record length indicators for unformatted files are the first four bytes of each record.

The logical unit number must be in the range from 0 to 100, and must be currently connected to a file when `ftell` is called.

This routine is thread-safe, and locks the associated stream before I/O is performed.

### Output

ERRNO is set on failure.

---

## FULLPATHQQ

*Returns the full path for a specified file or directory.*

---

### Prototype

```
USE IFLPORT
or
INTERFACE
    INTEGER(4) FUNCTION FULLPATHQQ(NAME, FULLPATH)
        CHARACTER(LEN=*) NAME, FULLPATH
    END FUNCTION
END INTERFACE
```

### Usage

```
result = FULLPATHQQ ( name, fullpath )
```

NAME                      CHARACTER(LEN=\*) . File name for which you want a full path. The file can be the name of a file in the current directory, or a relative directory or filename.

FULLPATH                  CHARACTER(LEN=\*) . CHARACTER VALUE that receives the full path of the item specified in NAME.

### Results

The result is the length of the full pathname in CHARACTERS, or 0 if the function fails. The function may fail if the name supplied is not an existing file. The length of FULLPATH will vary, depending on how deeply the directories are nested on the drive you are using. If the full path is longer than the character buffer provided to return it (FULLPATH), FULLPATHQQ returns only that portion of the path that fits.

You should verify the length of the path before using the value returned in FULLPATH. If the longest full path you are likely to encounter does not fit into the buffer you are using, allocate a larger character buffer. You can allocate the largest possible path buffer with the following statements:

```
USE IFLPORT
```

```
CHARACTER(MAXPATH) FULLPATH
```

MAXPATH is a symbolic constant defined in module IFLPORT.F90 as 260.

## Example

```
USE IFLPORT
```

```
CHARACTER(MAXPATH) BUF
```

```
CHARACTER(3)          DRIVE
```

```
CHARACTER(256)        DIR
```

```
CHARACTER(256)        NAME
```

```
CHARACTER(256)        EXT
```

```
CHARACTER(256)        FILE
```

```
INTEGER(4)            LEN
```

```
DO WHILE (.TRUE.)
```

```
  WRITE (*,*)
```

```
  WRITE (*,'(A)') ' Enter filename (Hit RETURN to  
                  exit): '
```

```
  LEN = GETSTRQQ(FILE)
```

```
  IF (LEN .EQ. 0) EXIT
```

```
  LEN = FULLPATHQQ(FILE, BUF)
```

```
  IF (LEN .GT. 0) THEN
```

```
    WRITE (*,*) buf(:len)
```

```
  ELSE
```

```
    WRITE (*,*) 'Can''t get full path'
```

```
    EXIT
```

```
  END IF
```

```
!
```

```
!Split path
```

```
WRITE (*,*)
```

```
LEN = SPLITPATHQQ(BUF, DRIVE, DIR, NAME, EXT)
```

```
IF (LEN .NE. 0) THEN
```

```
  WRITE (*, 900) ' Drive: ', DRIVE
```

```
  WRITE (*, 900) ' Directory: ', DIR(1:LEN)
```

```
  WRITE (*, 900) ' Name: ', NAME
```

```
        WRITE (*, 900) ' Extension: ', EXT
    ELSE
        WRITE (*, *) 'Can''t split path'
    END IF
END DO
900  FORMAT (A, A)
END
```

---

## GERROR

*Returns a message for last error*

---

### Prototype

```
INTERFACE
    SUBROUTINE GERROR(ERRORMSG)
        CHARACTER(LEN=*) ERRORMSG
    END SUBROUTINE
END INTERFACE
```

STRING            message for the last error detected

### Description

This routine returns a message for the last error detected.

### Output

The last error detected in STRING.

## GETARG

*Gets a specified command-line argument*

---

### Prototype

```
INTERFACE GETARG
  SUBROUTINE GETARG_DVF(N, BUFFER, STATUS)
    INTEGER(2), INTENT(IN) :: N
    CHARACTER(LEN=*), INTENT(OUT) :: BUFFER
    INTEGER(2), OPTIONAL :: STATUS
  END SUBROUTINE
  SUBROUTINE GETARG(ARGINDEX, ARGUMENT)
    INTEGER(4), INTENT(IN) :: ARGINDEX
    CHARACTER(LEN=*), INTENT(OUT) :: ARGUMENT
  END SUBROUTINE
END INTERFACE
```

N	(input) INTEGER(2). Position of the command-line argument to retrieve. The command itself is argument number 0.
BUFFER	(output) the space for argument to be returned into. Must be large enough, otherwise the result is truncated.
STATUS	(optional; output) INTEGER(2). STATUS is the original number of characters in the command-line argument. If specified, returns the completion status, that is, the number of characters in the retrieved command-line argument before truncation or blank-padding. Errors return a value of -1. Errors include specifying an argument position less than 0 or greater than the value returned by <a href="#">NARGS</a> .

### Description

GETARG returns the Nth command-line argument. If N is zero, GETARG returns the name of the executing program file.



GETARG can be used with two or three arguments. If you use module DFLIB.F90, you can mix calls to GETARG with two or three arguments, see Example below. If you do not use DFLIB.F90, you can use either two- or three-argument calls to GETARG but only one type within a subprogram.

With two arguments, the first one is of type `INTEGER(KIND=4)`. This version simply returns the Nth argument as a character variable. `ARGINDEX` (or `N`) must be zero or a positive integer. If there is an error while retrieving the argument, `ARGUMENT` (or `BUFFER`) is filled with blanks. If `ARGUMENT` is too short to hold the input argument, the input argument is truncated to the length corresponding to `ARGUMENT`. If `ARGUMENT` is longer than the input argument, then `ARGUMENT` is blank-filled on the right.

The second form of GETARG allows an optional parameter for the length of the input argument returned, before blank-padding or truncation. It also uses an `INTEGER(KIND=2)` argument index.

## Output

A string representing the Nth command-line argument to the executing program as it was entered. There is no case conversion

## Example

The following code illustrates a mix call to GETARG.

```
USE DFLIB
INTEGER(2) result
result = RUNQQ('prog', '-c -r')
END
! PROG.F90
USE DFLIB
INTEGER(2) n1, n2, status
CHARACTER(80) buf
n1 = 1
n2 = 2
CALL GETARG(n1, buf, status)
WRITE(*,*) buf
CALL GETARG(n2, buf )
WRITE (*,*) buf
END
```

## GETCHARQQ

*Gets the next keystroke.*

---

### Prototype

```
USE IFLPORT
or
! Get character from console
CHARACTER(LEN=1) FUNCTION GETCHARQQ()
END FUNCTION GETCHARQQ
```

### Usage

```
result = GETCHARQQ ( )
```

### Results

The result type is `CHARACTER(1)`, and has the value of the key that was pressed. The value can be any ASCII character. If the key pressed is represented by a single ASCII character, `GETCHARQQ` returns the character. If the key pressed is a function or direction key, a hex #00 or #E0 is returned. If you need to know which function or direction was pressed, call `GETCHARQQ` a second time to get the extended code for the key.

If there is no keystroke waiting in the keyboard buffer, `GETCHARQQ` will wait indefinitely until there is one, and then returns it. To determine in advance whether there is a character in the keyboard buffer, use `PEEKCHARQQ`, which returns `.TRUE.` if there is a character waiting in the keyboard buffer, and `.FALSE.` if not. This can prevent a program from hanging while `GETCHARQQ` waits for a keystroke that isn't there.

### Example

```
! Program to demonstrate GETCHARQQ
USE IFLPORT
CHARACTER(1) key / 'A' /
PARAMETER (ESC = 27)
PARAMETER (NOREP = 0)
WRITE (*,*) ' Type a key: (or q to quit)'
```

```

! Read keys until ESC or q is pressed
DO WHILE (ICHAR (key) .NE. ESC)
  key = GETCHARQQ()
! Some extended keys have no ASCII representation
IF(ICHAR(key) .EQ. NOREP) THEN
  key = GETCHARQQ()
  WRITE (*, 900) 'Not ASCII. Char = NA'
  WRITE (*,*)
! Otherwise, there is only one key
ELSE
  WRITE (*,900) 'ASCII. Char = '
  WRITE (*,901) key
END IF
IF (key .EQ. 'q' ) THEN
  EXIT
END IF
END DO
900  FORMAT (1X, A)
901  FORMAT (A)
END

```

---

## GETCONTROLFPQQ

*Returns the floating-point processor control word.*

---

### Prototype

```

USE IFLPORT
or
INTERFACE
  SUBROUTINE GETCONTROLFPQQ(CONTROL)
    INTEGER(2) CONTROL
  END SUBROUTINE
END INTERFACE

```

## Usage

CALL GETCONTROLFPQQ (CONTROL)

CONTROL            INTEGER ( 2 ). Floating-point processor control word.

The floating-point control word is a set of flags that determines various modes of the floating-point coprocessor. The IFLPORT.F90 module file contains constants defined for the control word as follows:

Parameter Name	Hex Value	Description
FPCW\$MCW_IC	Z'1000'	<b>Infinity control mask</b>
FPCW\$AFFINE	Z'1000'	Affine infinity
FPCW\$PROJECTIVE	Z'0000'	Projective infinity
FPCW\$MCW_PC	Z'0300'	<b>Precision control mask</b>
FPCW\$64	Z'0300'	64-bit precision
FPCW\$53	Z'0200'	53-bit precision
FPCW\$24	Z'0000'	24-bit precision
FPCW\$MCW_RC	Z'0C00'	<b>Rounding control mask</b>
FPCW\$CHOP	Z'0C00'	Truncate
FPCW\$UP	Z'0800'	Round up
FPCW\$DOWN	Z'0400'	Round down
FPCW\$NEAR	Z'0000'	Round to nearest
FPCW\$MSW_EM	Z'003F'	<b>Exception mask</b>
FPCW\$INVALID	Z'0001'	Allow invalid numbers
FPCW\$DENORMAL	Z'0002'	Allow denormals (very small numbers)
FPCW\$ZERODIVIDE	Z'0004'	Allow divide by zero
FPCW\$OVERFLOW	Z'0008'	Allow overflow
FPCW\$UNDERFLOW	Z'0010'	Allow underflow
FPCW\$INEXACT	Z'0020'	Allow inexact precision

By default, the floating-point control word settings are 53-bit precision, round to nearest, and the DENORMAL, UNDERFLOW and INEXACT precision exceptions disabled. An exception is disabled if its flag is set to 1 and enabled if its flag is cleared to 0. You can disable exceptions by setting the flags to 1 with SETCONTROLFPQQ.

If an exception is disabled, it does not cause an interrupt when it occurs. Instead, the exception generates an appropriate special value (NaN or signed infinity), but the program continues. When printing out such a value, the runtime library represents a NaN as ?????, positive infinity as ++++++, and negative infinity as -----.

You can find out which exceptions (if any) occurred by calling GETSTATUSFPQQ. If you have enabled errors on floating-point exceptions, clearing the flags to 0 with SETCONTROLFPQQ, an interrupt is generated when the exception occurs. Normally, these interrupts cause errors, but you can capture the interrupts with SIGNALQQ and branch to your own error-handling routines.

You can use GETCONTROLFPQQ to retrieve the current control word and SETCONTROLFPQQ to change the control word. In most cases, you will not need to change the default settings.

### Example

```
USE IFLPORT
INTEGER(2) CONTROL
CALL GETCONTROLFPQQ (CONTROL)
PRINT 10,CONTROL
10 FORMAT('Initial control settings ',Z)
      !if not rounding down
IF (IAND(CONTROL, FPCW$DOWN) .NE. FPCW$DOWN) THEN
  CONTROL = IAND(CONTROL, NOT(FPCW$MCW_RC))
      !clear all rounding
  CONTROL = IOR(control, FPCW$DOWN)
      !set to round down
  CALL SETCONTROLFPQQ(CONTROL)
CALL GETCONTROLFPQQ(CONTROL)
PRINT 20,control
20 FORMAT('Final control settings ',Z)
END IF
END
```

## GETCWD

*Retrieves the path of the current working directory.*

---

### Prototype

```
USE IFLPORT
or
INTERFACE
    INTEGER(4) FUNCTION GETCWD(DIRECTORY)
        CHARACTER(LEN=*) DIRECTORY
    END FUNCTION GETCWD
END INTERFACE
```

### Usage

```
result = GETCWD (directory)
```

**DIRECTORY**      CHARACTER (LEN=\*) . Character value that receives the current working directory path, including drive letter.

### Results

GETCWD returns zero for success, or an error code for failure.

### Example

```
USE IFLPORT
CHARACTER(LEN=30) DIRECTORY
! variable DIRECTORY must be long enough to hold
! entire string
INTEGER(4) ISTAT
ISTAT = GETCWD (DIRECTORY)
IF (ISTAT == 0) PRINT *, 'Current directory is ',
    DIRECTORY
END
```

---

## GETDAT

*Returns the current date in integer form*

---

### Prototype

```
INTERFACE GETDAT
  SUBROUTINE GETDAT(IYEAR,IMONTH,IDAY)
    INTEGER(4), INTENT(OUT) :: IYEAR,IMONTH,IDAY
  END SUBROUTINE
  SUBROUTINE GETDAT_DVF(IYEAR,IMONTH,IDAY)
    INTEGER(2), INTENT(OUT) :: IYEAR,IMONTH,IDAY
  END SUBROUTINE
END INTERFACE
```

IYEAR	an integer value
IMONTH	an integer value
IDAY	an integer value

### Description

This routine returns the current date in integer form. On Windows NT\* systems, this function is thread-safe.

### Output

The current date is returned. IYEAR contains the current year, reckoned by the Julian calendar. IMONTH contains the numerical version of the month, where 1 corresponds to January, and 12 corresponds to December. IDAY returns the numerical day of the month.

## GETDRIVEDIRQQ

*Gets the complete path of the current working directory on a specified disk drive.*

---

### Prototype

```
USE IFLPORT
or
INTERFACE
    ! Get the current directory for a given drive
    INTEGER(4) FUNCTION GETDRIVEDIRQQ(DRIVEDIR)
        CHARACTER(LEN=*) DRIVEDIR
    END FUNCTION
END INTERFACE
```

### Usage

```
result = GETDRIVEDIRQQ (DRIVEDIR)

DRIVEDIR      CHARACTER(LEN=*) . For input, DRIVEDIR contains
               the drive whose current working directory path is to be
               returned. On output, DRIVEDIR contains the current
               directory on that drive in the form d:\dir.
```

### Results

The result is `INTEGER(4)`. The result is the length (in bytes) of the full path on the specified drive. If the full path is longer than the size of `DRIVEDIR`, zero is returned.

You can make sure you get information about the current drive, by putting the symbolic constant `FILE$CURDRIVE` (defined in `IFLPORT.F90`) into `DRIVEDIR`.

Since disk drives are identified by a single alphabetic character, `GETDRIVEDIRQQ` examines only the first letter of `DRIVEDIR`. For instance, if `DRIVEDIR` contains the path `c:\program files`,



GETDRIVEDIRQQ (DRIVEDIR) returns the current working directory on drive C and disregards the rest of the path. Input is case-insensitive. The length of the path returned depends on how deeply the directories are nested on the drive specified in DRIVEDIR. If the full path is longer than the length of DRIVEDIR, GETDRIVEDIRQQ returns only the portion of the path that fits into DRIVEDIR. If you are likely to encounter a long path, allocate a buffer of size MAXPATH (where MAXPATH is a PARAMETER constant defined in IFLPORT.F90, and MAXPATH = 260).

**On Linux platforms**, the function gets a path only when symbolic constant FILE\$CURDRIVE (defined in IFLPORT.F90) is applied for argument `drivedir`.

### Example

```
! Program to demonstrate GETDRIVEDIRQQ
USE IFLPORT
CHARACTER(MAXPATH) dir
INTEGER(4) length
! Get current directory
dir = FILE$CURDRIVE
length = GETDRIVEDIRQQ(dir)
IF (length .GT. 0) THEN
    WRITE (*,*) 'Current directory is: '
    WRITE (*,*) dir
ELSE
    WRITE (*,*) 'Failed to get current directory'
END IF
END
```

## GETDRIVESIZEQQ

*Gets the total size of the specified DRIVE.*

---

### Prototype

```
USE IFLPORT
or
INTERFACE GETDRIVESIZEQQ
    LOGICAL(4) FUNCTION GETDRIVESIZEQQI4 (DriveNm,
    TotalNum, AvailableNum)
        CHARACTER(LEN=*) DriveNm
        INTEGER(4) TotalNum
        INTEGER(4) AvailableNum
    END FUNCTION
    LOGICAL(4) FUNCTION GETDRIVESIZEI8 (DriveNm,
    TotalNum, AvailableNum)
        CHARACTER(LEN=*) DriveNm
        INTEGER(8) TotalNum
        INTEGER(8) AvailableNum
    END FUNCTION
END INTERFACE
```

### Description

Gets the total size of the specified DRIVE and space available on it.

### Usage

```
result = GETDRIVESIZEQQ (DRIVENm, TOTALNUM,
    AVAILIABLENUM)
```

DriveNm            CHARACTER(LEN=\*). String containing the letter of the disk drive to get information about.

TotalNum           INTEGER(4) or INTEGER(8). TotalNum number of bytes on the disk drive

`AvailableNum` `INTEGER(4)` or `INTEGER(8)`. Number of bytes of `AVAILable` space on the disk drive.

## Results

The function returns `LOGICAL(4)`. The result is `.TRUE.` if successful; otherwise, `.FALSE..`

The data types specified for the `TotalNum` and `AvailableNum` arguments must be the same.

Some disk drives have more bytes than will fit into a 32 bit integer. Using an `INTEGER(4)` variable for these drives will return a negative size. To get the actual size for these large drives, `TotalNum` and `AvailableNum` must be `INTEGER(8)` variables.

Because disk drives are identified by a single alphabetic character, `GETDRIVESIZEQQ` examines only the first letter of `DriveNm`. The drive letter can be uppercase or lowercase. You can use the constant `FILE$CURDRIVE` (defined in `IFLPORT.F90`) to get the size of the current `DRIVE`.

If `GETDRIVESIZEQQ` fails, use `GETLASTERRORQQ` to determine the reason.

**On Linux platforms**, this routine always returns `.false..`

## Example

```
! Program to demonstrate GETDRIVESQQ and
GETDRIVESIZEQQ
USE IFLPORT
CHARACTER(26) drives
CHARACTER(1) adrive
LOGICAL(4) status
INTEGER(4) total, avail
INTEGER(2) i
! Get the list of drives
drives = GETDRIVESQQ()
WRITE (*,'(A, A)') ' Drives available: ', drives
!
```

```
!Cycle through them for free space and write to
console
DO i = 1, 26
  adrive = drives(i:i)
  status = .FALSE.
  WRITE (*,'(A, A, A,))' ' Drive ', CHAR(i + 64), ':'
  IF (adrive .NE. ' ') THEN
    status = GETDRIVESIZEQQ(adrive, total, avail)
  END IF
  IF (status) THEN
    WRITE (*,*) avail, ' of ', total, ' bytes free.'
  ELSE
    WRITE (*,*) 'Not available'
  END IF
END DO
END
```

---

## GETDRIVESQQ

*Reports which drives are available to the system.*

---

### Prototype

```
USE IFLPORT
or
INTERFACE
  CHARACTER(26) FUNCTION GETDRIVESQQ()
  END FUNCTION
END INTERFACE
```

### Usage

```
result = GETDRIVESQQ ( )
```

## Results

The result is `CHARACTER (LEN=26)`. The returned string contains letters for drives that are available, and blanks for drives that are not available. For example, on a system with A, C, and D drives, the string 'A CD' is returned.

**On Linux platforms**, this function returns a string filled with spaces.

---

# GETENV

*Return the value of a system environment variable.*

---

## Prototype

INTERFACE

    SUBROUTINE GETENV (VAR, VALUE)

        CHARACTER (LEN=\*) VAR, VALUE

    END SUBROUTINE

END INTERFACE

VAR                   must be CHARACTER type. Specifies the environment variable name.

VALUE                 must be CHARACTER type. The VALUE is assigned the environment variable's value. VALUE must be declared large enough to hold the value. If the environment variable is not defined, VALUE is set to all blanks.

## Description

Returns the value of a system environment variable.

## Class

Nonstandard subroutine.

## Example

The following code assigns VAL the value of the TERM environment variable.

```
CHARACTER(10) VAL
CALL GETENV("TERM", VAL)
```

---

## GETENVQQ

*Gets the value of a specified environment variable.*

---

## Prototype

```
USE IFLPORT
or
! ALTERNATIVE WAY OF GETTING ENVIRONMENT VARIABLE
VALUE
INTERFACE
  INTEGER(4) FUNCTION GETENVQQ(VARNAME,VALUE)
    CHARACTER(LEN=*) VARNAME,VALUE
  END FUNCTION GETENVQQ
END INTERFACE
```

## Description

Gets the value of a specified environment variable from the current environment.

## Usage

```
result = GETENVQQ (VARNAME, VALUE)
```

VARNAME            CHARACTER(LEN=\*) . The name of environment variable whose value you want to find.

VALUE             CHARACTER(LEN=\*) . Value of the specified environment variable, in uppercase.

## Results

The result type is `INTEGER(4)`. The result is the number of characters returned in `VALUE`. Zero is returned if the given variable is not defined.

`GETENVQQ` searches the list of environment variables for an entry corresponding to `VARNAME`. Environment variables define the environment in which a process executes. For example, the `LIB` environment variable defines the default search path for libraries to be linked with a program. Note that some environment variables may exist only on a per-process basis, and may not be present at the command-line level.

## Example

```
! Program to demonstrate GETENVQQ and SETENVQQ
USE IFLPORT
INTEGER(4) lenv, lval
CHARACTER(80) env, val, enval
WRITE (*,900) ' Enter environment variable name to
create, modify, or delete: '
lenv = GETSTRQQ(env)
IF (lenv .EQ. 0) STOP
WRITE (*,900) 'Value of variable (ENTER to delete): '
lval = GETSTRQQ(val)
IF (lval .EQ. 0) val = ' '
enval = env(1:lenv) // '=' // val(1:lval)
IF (SETENVQQ(enval)) THEN
    lval = GETENVQQ(env(1:lenv), val)
    IF (lval .EQ. 0) THEN
        WRITE (*,*) 'Can''t get environment variable'
    ELSE IF (lval .GT. LEN(val)) THEN
        WRITE (*,*) 'Buffer too small'
    ELSE
        WRITE (*,*) env(:lenv), ': ', val(:lval)
        WRITE (*,*) 'Length: ', lval
    END IF
ELSE
    WRITE (*,*) 'Can''t set environment variable'
```

```
END IF
      FORMAT (A)
END
```

---

## GETFILEINFOQQ

*Returns information about the specified file.*

---

### Prototype

#### IA-32 systems

```
USE IFLPORT or
INTERFACE
  INTEGER(4) FUNCTION GETFILEINFOQQ(FILE, BUFFER,
                                     DWHANDLE)

  CHARACTER(LEN=*) FILE
  TYPE FILE$INFO
  SEQUENCE
    INTEGER(4) CREATION    ! CREATION TIME (-1 ON FAT)
    INTEGER(4) LASTWRITE   ! LAST WRITE TO FILE
    INTEGER(4) LASTACCESS  ! LAST ACCESS (-1 ON FAT)
    INTEGER(4) LENGTH      ! LENGTH OF FILE
    INTEGER(2) PERMIT      ! FILE ACCESS MODE
    CHARACTER(LEN=255) NAME ! FILE NAME
  END TYPE
  TYPE(FILE$INFO) :: BUFFER
  INTEGER(4) DWHANDLE
  END FUNCTION GETFILEINFOQQ
END INTERFACE
```

#### Itanium™-based systems

```
INTERFACE
```



```

INTEGER(8) FUNCTION GETFILEINFOQQ(FILES,BUFFER,
                                DWHANDLE)

CHARACTER(LEN=*) FILES
TYPE FILE$INFO
SEQUENCE
    INTEGER(8) CREATION      ! Creation time (-1 ON FAT)
    INTEGER(8) LASTWRITE    ! LAST WRITE TO FILE
    INTEGER(8) LASTACCESS   ! LAST ACCESS (-1 ON FAT)
    INTEGER(4) LENGTH       ! LENGTH OF FILE
    INTEGER(2) PERMIT       ! FILE ACCESS MODE
    CHARACTER(LEN=255) NAME  ! FILE NAME
END TYPE
TYPE(FILE$INFO) :: BUFFER
    INTEGER(8) DWHANDLE
END FUNCTION GETFILEINFOQQ
END INTERFACE

```

## Description

Returns information about the specified file. Filenames can contain wildcards (\* and ?).

## Usage

```
result = GETFILEINFOQQ (FILES,BUFFER, HANDLE)
```

FILES	CHARACTER(LEN=*) . Name or pattern of files that you are looking for information on. It can include a full path and can include wildcards (* and ?).
BUFFER	Derived type FILE\$INFO. Information about a file that matches the search criteria is returned in this variable.
HANDLE	INTEGER(4) . Control mechanism. One of the following constants, defined in IFLPORT.F90:  FILE\$FIRST: First matching file found.  FILE\$LAST: Previous file was the last valid file.  FILE\$ERROR: No matching file found.

## Results

The result is `INTEGER(4)`, showing the nonblank length of the filename if a match was found, or 0 if no matching `FILES` were found.

To get information about one or more files, set `HANDLE` to `FILE$FIRST` and call `GETFILEINFOQQ`. This will return information about the first file which matches the name and return a `HANDLE`. If the program wants more files, it should call `GETFILEINFOQQ` with the `HANDLE`. `GETFILEINFOQQ` must be called with the `HANDLE` until `GETFILEINFOQQ` sets `HANDLE` to `FILE$LAST`, or system resources may be lost.

The derived-type element variables `FILE$INFO%CREATION`, `FILE$INFO%LASTWRITE`, and `FILE$INFO%LASTACCESS` contain packed date and time information that indicates when the file was created, last written to, and last accessed, respectively. To break the time and date into component parts, call `UNPACKTIMEQQ`. `FILE$INFO%LENGTH` contains the length of the file in bytes. `FILE$INFO%PERMIT` contains a set of bit flags describing access information about the file as follows:

Bit Flag	Corresponding File
<code>FILE\$ARCHIVE</code>	Marked as having been copied to a backup device.
<code>FILE\$DIR</code>	A subdirectory of the current directory. Each MS-DOS directory contains two special files, "." and "..". These are directory aliases created by MS-DOS for use in relative directory notation. The first refers to the current directory, and the second refers to the current directory's parent directory.
<code>FILE\$HIDDEN</code>	Hidden. It does not appear in the directory list you request from the command line, the Microsoft visual development environment browser, or File Manager.
<code>FILE\$READONLY</code>	Write-protected. You can read the file, but you cannot make changes to it.
<code>FILE\$SYSTEM</code>	Used by the operating system.
<code>FILE\$VOLUME</code>	A logical volume, or partition, on a physical disk drive. This type of file appears only in the root directory of a physical device.

You can use the constant `FILE$NORMAL` to check that all bit flags are set to 0. If the derived-type element variable `FILE$INFO%PERMIT` is equal to `FILE$NORMAL`, the file has no special attributes. The variable `FILE$INFO%NAME` contains the short name of the file, not the full path of the file.

If an error occurs, call `GETLASTERRORQQ` to retrieve the error message, such as:

<code>ERR\$NOENT</code>	The file or path specified was not found.
<code>ERR\$NOMEM</code>	Not enough memory is available to execute the command; or the available memory has been corrupted; or an invalid block exists, indicating that the process making the call was not allocated properly.

### Example

```
USE IFLPORT
CALL SHOWPERMISSION( )
END
SUBROUTINE SHOWPERMISSION()
! SUBROUTINE to demonstrate GETFILEINFOQQ
!
USE IFLPORT
!
CHARACTER(80) files
INTEGER(4) handle, length
CHARACTER(5) permit
TYPE (FILE$INFO) info
!
WRITE (*, 900) ' Enter wildcard of files to view: '
900   FORMAT (A)
length = GETSTRQQ(files)
handle = FILE$FIRST
DO WHILE (.TRUE.)
    length = GETFILEINFOQQ(files, info, handle)
    IF ((handle .EQ. FILE$LAST) .OR. &
        (handle .EQ. FILE$ERROR)) THEN
```

```

SELECT CASE (GETLASTERRORQQ())
  CASE (ERR$NOMEM)
    WRITE (*,*) 'Out of memory'
  CASE (ERR$NOENT)
    EXIT
  CASE DEFAULT
    WRITE (*,*) 'Invalid file or path name'
  END SELECT
END IF
  permit = ' '
  IF ((info%permit .AND. FILE$HIDDEN) .NE. 0) &
    permit(1:1) = 'H'
  IF ((info%permit .AND. FILE$SYSTEM) .NE. 0) &
    permit(2:2) = 'S'
  IF ((info%permit .AND. FILE$READONLY) .NE. 0) &
    permit(3:3) = 'R'
  IF ((info%permit .AND. FILE$ARCHIVE) .NE. 0) &
    permit(4:4) = 'A'
  IF ((info%permit .AND. FILE$DIR) .NE. 0) &
    permit(5:5) = 'D'
  WRITE (*, 9000) info%name, info%length, permit
9000  FORMAT (1X, A20, I9, ' ',A6)
END DO
END SUBROUTINE

```

---

## GETGID

*Gets the group ID*

---

### Prototype

```

INTERFACE
  INTEGER FUNCTION GETGID ( )

```

```
END FUNCTION GETGID
END INTERFACE
```

### Description

This function returns an integer corresponding to the primary group of the user under whose identity this program is running.

On Win32\* systems, this function returns the last subauthority of the security identifier for TokenPrimaryGroup for this process. This is unique on a local machine and unique within a domain for domain accounts.



---

**NOTE.** *You should be aware that on Win32 systems, domain accounts and local accounts can overlap.*

---

**On Linux platforms**, this function returns group identity for the current process.

### Output

An integer representing the group that the currently logged in user belongs to.

---

## GETLASTERROR

*Gets the last error set*

---

### Prototype

```
INTERFACE
  INTEGER(4) FUNCTION GETLASTERROR ( )
  END FUNCTION GETLAST
END INTERFACE
```

## Description

This function returns the integer corresponding to the last runtime error value that was set.

For example, if you use an `ERR= specifier` on an I/O statement, your program will not abort in the event of an error. `GETLASTERROR` provides a way to determine what the error condition was, with a better degree of certainty than just examining `errno`. Your application code may then take appropriate action based upon the error number.

## Output

Last error number into an integer.

---

## GETLASTERRORQQ

*Returns the last error set by a run-time procedure.*

---

## Prototype

```
USE IFLPORT
or
INTERFACE
    INTEGER(4) FUNCTION GETLASTERRORQQ( )
    END FUNCTION
END INTERFACE
```

## Usage

```
result = GETLASTERRORQQ ( )
```

## Results

The result is `INTEGER(4)`, and shows the most recent error code generated by a run-time procedure.

Descriptions that return a logical or integer value sometimes also provide an error code that identifies the cause of errors. GETLASTERRORQQ retrieves the most recent error number, usually associated with errno. The error constants are in IFLPORT.F90 The following table shows some of the portability library routines and the errors each routine produces:

Runtime Routine	Runtime Routines Errors
RUNQQ	ERR\$NOMEM, ERR\$2BIG, ERR\$INVAL, ERR\$NOENT, ERR\$NOEXEC
SYSTEMQQ	ERR\$NOMEM, ERR\$2BIG, ERR\$NOENT, ERR\$NOEXEC
GETDRIVESIZEQQ	ERR\$INVAL, ERR\$NOENT
GETDRIVESQQ	no error
GETDRIVEDIRQQ	ERR\$NOMEM, ERR\$RANGE
CHANGEDRIVEQQ	ERR\$INVAL, ERR\$NOENT
CHANGEDIRQQ	ERR\$NOMEM, ERR\$NOENT
MAKEDIRQQ	ERR\$NOMEM, ERR\$ACCES, ERR\$EXIST, ERR\$NOENT
DELDIRQQ	ERR\$NOMEM, ERR\$ACCES, ERR\$NOENT
FULLPATHQQ	ERR\$NOMEM, ERR\$INVAL
SPLITPATHQQ	ERR\$NOMEM, ERR\$INVAL
GETFILEINFOQQ	ERR\$NOMEM, ERR\$NOENT, ERR\$INVAL
SETFILETIMEQQ	ERR\$NOMEM, ERR\$ACCES, ERR\$INVAL, ERR\$MFILE, ERR\$NOENT
SETFILEACCESSQQ	ERR\$NOMEM, ERR\$INVAL, ERR\$ACCES
DELFILESQQ	ERR\$NOMEM, ERR\$ACCES, ERR\$NOENT, ERR\$INVAL
RENAMEFILEQQ	ERR\$NOMEM, ERR\$ACCES, ERR\$NOENT, ERR\$XDEV
FINDFILEQQ	ERR\$NOMEM, ERR\$NOENT
PACKTIMEQQ	no error
UNPACKTIMEQQ	no error
COMMITQQ	ERR\$BADF

Runtime Routine	Runtime Routines Errors
GETCHARQQ	no error
PEEKCHARQQ	no error
GETSTRQQ	no error
GETLASTERRORQQ	no error
SETERRORMODEQQ	no error
GETENVQQ	ERR\$NOMEM, ERR\$NOENT
SETENVQQ	ERR\$NOMEM, ERR\$INVAL
SLEEPQQ	no error
BEEPQQ	no error
SORTQQ	ERR\$INVAL
BSEARCHQQ	ERR\$INVAL

---

## GETLOG

*Returns the user's login name*

---

### Prototype

```

INTERFACE
  SUBROUTINE GETLOG (NAME)
    CHARACTER (LEN=*) NAME
  END SUBROUTINE GETLOG
END INTERFACE

```

NAME                    the login name

### Description

This function allows your application to determine the login name of the person running the application. The login name must be less than 64 characters. If the login name is longer than 64 characters, it will be



truncated. The actual parameter corresponding to the formal parameter `NAME` in the prototype should be long enough to hold the login name. If the supplied actual parameter is too short to hold the login name, the login name will be truncated.

### Output

A character string in `NAME` corresponding to the login name of the person running the application. If the login name is shorter than the actual parameter corresponding to `NAME`, the login name is padded with blanks at the end, until it reaches the length of the actual parameter.

---

## GETPID

*Gets the process ID*

---

### Prototype

```
INTERFACE
    INTEGER FUNCTION GETPID ( )
    END FUNCTION GETPID
END INTERFACE
```

### Description

This function returns the process ID of the current process.

### Output

A unique integer corresponding to the system process identifier for the current process.

---

## GETPOS

*Returns the current file position in bytes from the beginning of the file*

---

### Prototype

```
INTERFACE
```

```
  INTEGER FUNCTION GETPOS (LUNIT)
```

```
  INTEGER(4) LUNIT
```

```
END FUNCTION GETPOS
```

```
END INTERFACE
```

LUNIT            INTEGER Fortran logical unit number for a file. The value must be in the range 0 to 100 and must correspond to a connected file.

### Description

Allows you to determine the current file position.

### Output

An integer value representing the number of bytes from the beginning of the file. Equivalent to FTELL. Returns EINVAL in errno and a result of -1 for an error.

---

## GETSTATUSFPQQ

*Returns the floating-point processor status word.*

---

### Prototype

```
USE IFLPORT
```

```

or
INTERFACE
    SUBROUTINE GETSTATUSFPQQ (STATUS )
        INTEGER ( 2 )          STATUS
    END SUBROUTINE
END INTERFACE

```

### Usage

CALL GETSTATUSFPQQ (STATUS)

STATUS                    INTEGER ( 2 ) . Floating-point co-processor status word.

The floating-point status word (FPSW) shows whether various floating-point exception conditions have occurred. After an exception occurs, the runtime system does not reset flags before performing additional floating-point operations. A status flag with a value of one thus shows there has been at least one occurrence of the corresponding exception. The following table lists the status flags and their values:

Parameter Name	Hex Value	Description
FPSW\$MSW_EM	Z'003F'	Status Mask (set all flags to 1)
FPSW\$INVALID	Z'0001'	An invalid result occurred
FPSW\$DENORMAL	Z'0002'	A denormal (very small number) occurred
FPSW\$ZERODIVIDE	Z'0004'	A divide by zero occurred
FPSW\$OVERFLOW	Z'0008'	An overflow occurred
FPSW\$UNDERFLOW	Z'0010'	An underflow occurred
FPSW\$INEXACT	Z'0020'	Inexact precision occurred

You can use a bit-wise AND on the status word returned by GETSTATUSFPQQ to determine which floating-point exception has occurred.

An exception is disabled if its flag is set to 1 and enabled if its flag is cleared to 0. By default, the denormal, underflow and inexact precision exceptions are disabled, and the invalid, overflow and divide-by-zero exceptions are enabled. Exceptions can be enabled and disabled by clearing

and setting the flags with SETCONTROLFPQQ. You can use GETCONTROLFPQQ to determine which exceptions are currently enabled and disabled.

If an exception is disabled, it does not cause an interrupt when it occurs. Instead, floating-point processes generate an appropriate special value (NaN or signed infinity), but the program continues. When printed, the runtime-system represents a NaN as ????, positive infinity as ++++++, and negative infinity as -----. You can find out which exceptions (if any) occurred by calling GETSTATUSFPQQ.

If errors on floating-point exceptions are enabled (by clearing the flags to 0 with SETCONTROLFPQQ), an interrupt is generated when the exception occurs. By default, these interrupts cause run-time errors, but you can capture the interrupts with SIGNALQQ and branch to your own error-handling routines.

## Example

```
! Program to demonstrate GETSTATUSFPQQ
USE IFLPORT
INTEGER(2) status
CALL GETSTATUSFPQQ(status)
! check for divide by zero
IF (IAND(status, FPSW$ZERODIVIDE) .NE. 0) THEN
    WRITE (*,*) 'Divide by zero occurred.', &
               'Look for NaN or signed infinity in
               resultant data.'
ELSE
    PRINT *, "Divide by zero flag was not set"
END IF
END
```

---

## GETSTRQQ

*Reads a character string from the keyboard using buffered input.*

---

### Prototype

```
USE IFLPORT
or
INTERFACE
    INTEGER(4) FUNCTION GETSTRQQ(BUFFER)
        CHARACTER(LEN=*) BUFFER
    END FUNCTION
END INTERFACE
```

### Usage

```
result = GETSTRQQ (BUFFER)
BUFFER      CHARACTER(LEN=*) . Character value returned from
                        keyboard, padded on the right with blanks.
```

### Results

The result is the number of characters placed in BUFFER. The function continues, until the user presses Return or Enter.

### Example

```
! Program to demonstrate GETSTRQQ
USE IFLPORT
INTEGER(4) length, result
CHARACTER(80) prog, args
WRITE (*, '(A,)' ) ' Enter program to run: '
length = GETSTRQQ (prog)
WRITE (*, '(A,)' ) ' Enter arguments: '
length = GETSTRQQ (args)
result = RUNQQ (prog, args)
```

```

      IF (result .EQ. -1) THEN
        WRITE (*,*) 'Couldn't run program'
      ELSE
        WRITE (*, '(A, Z4, A)') 'Return code : ', result,
          'h'
      END IF
    END
  END

```

---

## GETTIM

*Returns the time*

---

### Prototype

```

INTERFACE
  SUBROUTINE GETTIM(HOUR,MIN,SEC,HDTs)
    INTEGER(4), INTENT(OUT) :: HOUR,MIN,SEC,HDTs
  END SUBROUTINE
  SUBROUTINE GETTIM_DVF(HOUR,MIN,SEC,HDTs)
    INTEGER(2), INTENT(OUT) :: HOUR,MIN,SEC,HDTs
  END SUBROUTINE
END INTERFACE

```

HOUR	current system hour
MINUTE	current system minutes
SECOND	current system seconds
HUNDREDTH	current system hundredths of a second

### Description

This function gets the current system time in hours, minutes, seconds, and hundredths of a second. The time units are returned as separate integers to the calling routine.

## Output

The time units are returned as separate integers to the calling routine.

---

# GETUID

*Gets the user ID of the calling process*

---

## Prototype

```
INTERFACE
    INTEGER FUNCTION GETUID( )
    END FUNCTION GETUID
END INTERFACE
```

## Description

This function returns an integer corresponding to the user identity under which this program is running. This function returns the last subauthority of the security identifier for this process. This is unique on a local machine and unique within a domain for domain accounts.



---

**NOTE.** *You should be aware that on Win32 systems, domain accounts and local accounts can overlap.*

---

**On Linux platforms,** this function returns user identity for the current process.

## Output

The user ID of the calling process.

## GMTIME

*Converts the given elapsed time to the current system time*

---

### Prototype

#### IA-32 systems

```
SUBROUTINE GMTIME ( STIME , DATEARRAY )
    INTEGER ( 4 ) STIME
    INTEGER ( 4 ) DATEARRAY ( 9 )
END SUBROUTINE
```

#### Itanium™-based systems

```
SUBROUTINE GMTIME ( STIME , DATEARRAY )
    INTEGER ( 8 ) STIME
    INTEGER ( 4 ) DATEARRAY ( 9 )
END SUBROUTINE
```

**STIME** STIME represents an elapsed time in seconds since midnight, January 1, 1970, in GMT. You can obtain this value from GETTIMEOFDAY, if you adjust the result of GETTIMEOFDAY for your local time zone.

**DATEARRAY ( 1 : 9 )** contains the current date and system time, GMT.

DATEARRAY ( 1 ) seconds (0-59)

DATEARRAY ( 2 ) minutes (0-59)

DATEARRAY ( 3 ) hours (0-23)

DATEARRAY ( 4 ) day of month (1-31)

DATEARRAY ( 5 ) month (0-11)

DATEARRAY ( 6 ) year in century (0-99)

DATEARRAY ( 7 ) day of week (0-6, 0 is Sunday)

DATEARRAY ( 8 ) day of year (0-365)

DATEARRAY ( 9 ) daylight savings (1, if in effect; else 0)



## Description

This function converts a given elapsed time in seconds into the current system date, GMT.



---

**NOTE.** *This function may give problems with the year 2000. Use DATE\_AND\_TIME instead.*

---

## Output

The current date and system time for Greenwich Mean Time, in DATEARRAY.

---

# HOSTNAM

*Retrieves the current host computer name.*

---

## Prototype

```
USE IFLPORT
or
INTERFACE
    INTEGER(4) FUNCTION HOSTNM(NAME)
        CHARACTER(LEN=*) , INTENT(OUT) :: NAME
    END FUNCTION
END INTERFACE
```

## Description

Retrieves the current host computer name. This function is exactly the same as HOSTNM.

## Usage

```
result = HOSTNAM (NAME)
```

NAME CHARACTER (LEN=\*) . The name of the current computer host is returned in NAME. The buffer provided should be at least as long as MAX\_COMPUTERNAME\_LENGTH, which is defined in the IFLPORT module.

## Results

The result is zero if successful. If NAME is not long enough to contain all of the host name, the function truncates the host name and returns -1.

## Example

```
USE IFLPORT
CHARACTER (LEN=15) HOSTNAME
INTEGER(4) ISTATUS
ISTAT = HOSTNAM (HOSTNAME)
PRINT *, HOSTNAME, ' ISTATUS = ', ISTATUS
END
```

---

# HOSTNM

*Gets the current host name*

---

## Prototype

```
INTERFACE
  SUBROUTINE HOSTNM( NAME )
    CHARACTER (LEN=*) NAME
  END SUBROUTINE HOSTNM
END INTERFACE
```

NAME                    A CHARACTER variable or array element large enough to hold the name of the current host computer. On Win32 systems, the maximum host name length is 15.

### Description

This function retrieves the current host computer name.

### Output

An ASCII character string specifying the name of the host computer where your application is executing.

---

## IARGC

*Returns the number of arguments on the command line*

---

### Prototype

```
INTERFACE
  INTEGER(4) FUNCTION IARGC ( )
  END FUNCTION IARC
END INTERFACE
```

### Description

This function returns the number of arguments on the command line, not including the command itself.

### Output

Number of arguments into an integer. If no arguments are passed to the program, IARGC returns zero. Otherwise IARGC returns a count of the arguments that follow the program name on the command line.

## Example

The statement `PRINT *, IARGC ( )` prints a count of the arguments passed to the program.

---

## IDATE

*Returns the current system date*

---

### Prototype

```
INTERFACE
  SUBROUTINE IDATE (MONTH, DAY, YEAR)
    INTEGER (4) INTENT (OUT) :: MONTH, DAY, YEAR
  END SUBROUTINE IDATE
  SUBROUTINE F_IDATE (SDATE)
    INTEGER (4) INTENT (OUT) :: SDATE (3)
  END SUBROUTINE F_IDATE
END INTERFACE
```

MONTH	Output. Current system month
DAY	Output. Current system day
YEAR	Output. Current system year as an offset from 1900
SDATE	Output. Three-element array that holds day as element 1, month as element 2, and year as element 3. The month is between 1 and 12 and the year is greater than or equal to 1969.

### Description

This routine returns the current system month, day, and year.

## Example

The statement `CALL IDATE (MONTH, DAY, YR)` sets `MON` to the month number, `DAY` to the day of the month, and `YR` to the two-digit year representation (for example, 69 for the year 1969).



---

**NOTE.** *This subroutine is not year-2000 compliant. Use `DATE_AND_TIME` or `IDATE4` instead.*

---

---

## IDATE4

*Returns the current system date*

---

### Prototype

```
INTERFACE
  SUBROUTINE IDATE4(MONTH, DAY, YEAR)
    INTEGER(4), INTENT(OUT) :: MONTH, DAY, YEAR
  END SUBROUTINE
  SUBROUTINE F_IDATE4(SDATE)
    INTEGER(4), INTENT(OUT) :: SDATE(3)
  END SUBROUTINE
END INTERFACE
DATEARRAY      an integer array.
```

### Description

This routine returns the current system month, day, and year.

This function is year-2000 compliant.

### Output

`DATEARRAY(1)` Current system day.

DATEARRAY ( 2 )	Current system month.
DATEARRAY ( 3 )	Current system year as an offset from 1900, if the year is less than 2000. For years greater than or equal to 2000, this element simply returns the integer year, such as 2003.

---

## IEEE\_FLAGS

*Sets IEEE flags*

---

### Prototype

```

INTERFACE
  INTEGER FUNCTION IEEE_FLAGS (ACTION, MODE, IN, OUT)
  CHARACTER(LEN=*) ACTION, MODE, IN, OUT
  END FUNCTION IEEE_FLAGS
END INTERFACE

ACTION      is one of: 'GET', 'SET', 'CLEAR'
MODE        is one of: 'direction', 'precision',
                        'exception'

IN          is one of: 'inexact', 'division', 'underflow',
                        'overflow', 'invalid', 'all', 'common',
                        'nearest-to-zero', 'negative', 'positive',
                        'extended', 'double', 'single'

OUT         if MODE is 'direction', OUT is one of:
                        'nearest-to-zero', 'negative', 'positive'
            if MODE is 'precision', OUT is one of:
                        'extended', 'double', 'single'
            if MODE is 'exception', OUT is one of: 'inexact',
                        'division', 'underflow', 'overflow',
                        'invalid'

```

## Description

IEEE\_FLAGS is an elemental function that sets IEEE flags for GET, SET, and CLEAR procedures.

## Output

Returns 0 if executes successfully, 1 otherwise.

---

# IEEE\_HANDLER

*Establishes a handler for IEEE exceptions*

---

## Prototype

### IA-32 systems

```
INTERFACE
  INTEGER(4) FUNCTION IEEE_HANDLER (ARG_ACTION,&
    ARG_EXCEPTION,HANDLER)
  CHARACTER(LEN=*) ARG_ACTION, ARG_EXCEPTION
  INTERFACE
    SUBROUTINE HANDLER (SIGNO,SIGINFO)
      INTEGER(4), INTENT(IN)::SIGNO, SIGINFO
    END SUBROUTINE
  END INTERFACE
END FUNCTION IEEE_HANDLER
END INTERFACE
```

### Itanium™-based systems

```
INTERFACE
  INTEGER(8) FUNCTION IEEE_HANDLER (ARG_ACTION,&
    ARG_EXCEP,HANDLER)
  CHARACTER(LEN=*) ARG_ACTION, ARG_EXCEPT
  INTERFACE
    SUBROUTINE HANDLER (SIGNO,SIGINFO)
      INTEGER(4), INTENT(IN)::SIGNO, SIGINFO
    END SUBROUTINE
  END INTERFACE
END FUNCTION IEEE_HANDLER
END INTERFACE
```

```
END SUBROUTINE
END INTERFACE
END FUNCTION IEEE_HANDLER
END INTERFACE
```

## Description

IEEE\_HANDLER calls HANDLER subroutine to establish a handler for IEEE exceptions.

## Output

Returns 0 if executes successfully, 1 otherwise.

---

# IERRNO

*Returns the last error code generated*

---

## Prototype

```
INTERFACE
  INTEGER(4) FUNCTION IERRNO( )
END FUNCTION IERRNO
END INTERFACE
```

## Description

This function returns the number of the last detected error from any module that returns error codes.

## Output

The last error code generated.



---

## IFL\_RUNTIME\_INIT

*Initializes the Fortran runtime system,  
complete with command line arguments*

---

### Prototype

```
INTERFACE
  SUBROUTINE IFL_RUNTIME_INIT ( NCMDARGS, ARGS )
    INTEGER(4) NCMDARGS
    INTEGER(1), POINTER :: ARGS
  END INTERFACE
```

NCMDARGS	The number of arguments on the command line for the application.
ARGS	A pointer to an array of character strings, where each string makes up a command line argument

### Description

This routine initializes the Fortran runtime system, including supplying command line arguments. Normally this is not required. However, if your main program is written in C, or your main program is a WINMAIN in C or C++ for Windows\*, there may be circumstances where you wish to set the command line arguments for the Fortran portion of the program, and perform other initialization. For IA-32 Windows applications, you would call this routine from C as:

```
extern void IFL_RUNTIME_INIT ( int *argc, char
                             *argv[] );

int main(int *argc, char *argv[] )
{
  IFL_RUNTIME_INIT( argc, argv);
}
```

---

## IFLOAT

*Converts an input value to a real value*

---

### Prototype

```
INTERFACE
  REAL(4) FUNCTION IFLOAT (IN)
    INTEGER(2) IN
  END FUNCTION IFLOAT
END INTERFACE
```

IN                    an INTEGER(2) expression

### Description

Converts an input value to REAL(4).

### Output

The equivalent REAL(4) value.

---

## IFLOATI

*Converts an INTEGER(2) to a REAL type*

---

### Prototype

```
INTERFACE
  REAL(4) FUNCTION IFLOATI (INPUT)
    INTEGER(2), INTENT(IN)::INPUT
  END FUNCTION IFLOATI
END INTERFACE
```

INPUT                    a scalar INTEGER (KIND=2) value

### Description

IFLOATI is an elemental function that converts a scalar integer (KIND=2) type to REAL ( 4 ).

### Output

The integer value converted to REAL.

---

## IFLOATJ

*Converts an integer to a real value*

---

### Prototype

```
INTERFACE
  REAL( 4 ) FUNCTION IFLOATJ ( IN )
    INTEGER( 4 ) IN
  END FUNCTION IFLOATJ
END INTERFACE
```

IN                    an INTEGER ( 4 ) expression

### Description

Converts an input value to REAL ( 4 ).

### Output

The equivalent REAL ( 4 ) value.

---

## INMAX

*Returns the maximum positive integer*

---

### Prototype

```
INTERFACE
  INTEGER(4) FUNCTION INMAX (INPUT)
    INTEGER(4), INTENT(IN) :: INPUT
  END FUNCTION INMAX
END INTERFACE
```

INPUT                    an INTEGER( 4 ) value

### Description

This function returns the maximum positive value for an INTEGER( 4 ).

### Output

The maximum 4-byte-signed integer.

---

## INTC

*Converts INTEGER(4) to INTEGER(2)*

---

### Prototype

```
INTERFACE
  INTEGER(2) FUNCTION INTC (IN)
    INTEGER IN
  END FUNCTION INTC
END INTERFACE
```

IN                        any INTEGER( 4 ) value or expression

**Description**

Converts an `INTEGER(4)` value or expression to an `INTEGER(2)` value.

**Output**

The value of `IN` converted to a type `INTEGER(2)`. Overflow is ignored.

---

## IRAND

*Generates pseudorandom numbers.*

---

```
INTERFACE
  INTEGER(4) FUNCTION IRAND( )
  INTEGER(4) ISEED
  END FUNCTION IRAND
END INTERFACE
```

**Description**

Generates pseudorandom numbers.

**Class**

Elemental nonstandard function.

**Result Type and Type Parameter**

`INTEGER(4)` type.

**Result Value**

`IRAND` generates numbers in the range 0 through  $2^{31}$ .

**Example**

```
INTEGER(4) rn
rn = IRAND( )
```



---

**NOTE.** *For details about restarting the pseudorandom number generator used by IRAND and RAND, see the “sRAND” section.*

---

---

## IRANDM

*A synonym for IRAND.*

---

### Description

This function is a synonym for IRAND. It takes the same parameters and produces the same result.

---

## IRANGET

*Gets a random number*

---

### Prototype

```
INTERFACE
  SUBROUTINE IRANGET (S)
    INTEGER(4) S
  END SUBROUTINE IRANGET
END INTERFACE
```

S                      an integer expression

### Description

Returns the next in a series of pseudo-random numbers.

**Output**

An integer pseudo random number.

---

**IRANSET**

*Sets the seed for a sequence of  
pseudo-random numbers*

---

**Prototype**

```
INTERFACE
  SUBROUTINE IRANSET ( ISEED )
    INTEGER(4) ISEED
  END SUBROUTINE IRANSET
END INTERFACE
```

ISEED                    the new seed for a sequence of pseudo-random numbers

**Description**

Sets the seed for a sequence of random numbers.

**Output**

Changes the internal seed. Not thread-safe.

---

## ISATTY

*Returns true if the specified unit number is a terminal*

---

### Prototype

```
INTERFACE
  LOGICAL(4) FUNCTION ISATTY (LUNIT)
    INTEGER(40, INTENT(IN)) :: LUNIT
  END FUNCTION ISATTY
END INTERFACE
```

LUNIT            an integer expression corresponding to a Fortran logical unit number in the range of 0 to 100

### Description

This function returns true if the specified unit number is a terminal. The unit must be connected.

LUN must be an integer expression. If LUN is out of range, zero is returned. LUN must map to a connected Fortran logical unit at the time of the call. If LUN corresponds to a unit that is not connected, zero is returned.

### Output

.TRUE. for a logical unit connected to a terminal device. .FALSE. otherwise.



---

## ITIME

*Returns the time*

---

### Prototype

```
INTERFACE
  SUBROUTINE ITIME (TIME_ARRAY)
    INTEGER(4) TIME_ARRAY(3)
  END FUNCTION ITIME
END INTERFACE
```

TIME\_ARRAY     an integer array

### Description

This function returns the time in numeric form in a 3-element array.

### Output

TIME\_ARRAY[ 1 ] contains the hour.

TIME\_ARRAY[ 2 ] contains the minutes.

TIME\_ARRAY[ 3 ] contains the seconds.

---

## JABS

*Returns the absolute value*

---

### Prototype

```
INTERFACE
  INTEGER FUNCTION JABS (I)
    INTEGER(4), INTENT(IN) :: I
  END FUNCTION JABS
END INTERFACE
```

---

## JDATE

*Returns the date in ASCII*

---

### Prototype

```
INTERFACE
  FUNCTION JDATE ( )
    CHARACTER (LEN=8) :: JDATE
  END FUNCTION JDATE
END INTERFACE
```

### Description

This function returns an 8-character ASCII string with the Julian date, (day of the year).

### Output

An 8-character ASCII string with the Julian date in the form yyddd.



---

**NOTE.** *Use of this function is discouraged due to possible problems with the change to the year 2000. Use DATEANDTIME, a standard function instead.*

---

---

## JDATE4

*Returns the date in ASCII*

---

### Prototype

```
INTERFACE
```

```
SUBROUTINE JDATE4 (CURRENTDATE )  
  CHARACTER (LEN=10) CURRENTDATE  
  END SUBROUTINE JDATE4  
END INTERFACE
```

### Description

This function returns an 10-character ASCII string with the Julian date, (day of the year).

### Output

An 10-character ASCII string with the Julian date in the form yyyyddd.

---

## KILL

*Sends a signal to a process given by ID.*

---

### Prototype

```
USE IFLPORT
```

or

```
INTERFACE
```

```
  INTEGER(4) FUNCTION KILL (PID, SIGNUM)
```

```
  INTEGER(4) PID, SIGNUM
```

```
  END FUNCTION
```

```
END INTERFACE
```

PID                    ID of a process to be signaled

SIGNUM                Signal value

### Description

This function kills the process associated with the specified PID. This function requires that the program executing this function have `TERMINATE_PROCESS` access to the process being killed.

## Output

If successful, zero.

---

## LCWRQQ

*Sets the value of the floating-point processor control word.*

---

## Prototype

```
USE IFLPORT
or
INTERFACE
  SUBROUTINE LCWRQQ(CONTROL)
    INTEGER(2) CONTROL
  END SUBROUTINE
END INTERFACE
```

## Usage

```
CALL LCWRQQ (CONTROL)
```

CONTROL            INTEGER(2). Floating-point processor control word.

LCWRQQ performs the same function as SETCONTROLFPQQ and is provided for compatibility.

## Example

```
USE IFLPORT
INTEGER(2) control
CALL SCWRQQ(control) ! get control word
! Set control word to make processor round up
control = control .AND. (.NOT. FPCW$MCW_RC) ! Clear
                                           ! control
word with inverse
```

```

                                ! of
rounding control mask
control = control .OR. FPCW$UP ! Set control word
                                ! to round up

CALL LCWRQQ(control)
WRITE (*, 9000) 'Control word: ', control
9000 FORMAT (1X, A, Z4)
END

```

---

## LTIME

*Returns the components of the local  
time zone time*

---

### Prototype

#### IA-32 systems

```

INTERFACE
    SUBROUTINE LTIME(TIME,ARRAY)
    INTEGER(4) TIME,ARRAY(9)
    END SUBROUTINE
END INTERFACE

```

#### Itanium-based systems:

```

INTERFACE
    SUBROUTINE LTIME(TIME,ARRAY)
    INTEGER(8) TIME
    INTEGER(40) ARRAY(9)
    END SUBROUTINE
END INTERFACE

```

```

INTEGER(4) TIME    An elapsed time in seconds since 00:00:00
                   Greenwich Mean Time, January 1, 1970

```

## Description

Returns the components of the local time zone time in a nine-element array.

ARRAY	INTEGER ( 4 ) one-dimensional array with nine elements to contain local date and time data derived from TIME returned as follows:
ARRAY ( 1 )	Seconds (0-59)
ARRAY ( 2 )	Minutes (0-59)
ARRAY ( 3 )	Hours (0-23)
ARRAY ( 4 )	Day of month (1-31)
ARRAY ( 5 )	Month (0-11)
ARRAY ( 6 )	Year number in century (0-99)
ARRAY ( 7 )	Day of week (0-6, where 0 is Sunday)
ARRAY ( 8 )	Day of year (1-365)
ARRAY ( 9 )	1 if daylight savings time is in effect; otherwise, 0.




---

**NOTE.** *This function is not year 2000 compliant, use DATE\_AND\_TIME instead.*

---



---

## MAKEDIRQQ

*Creates a new directory with a specified name.*

---

## Prototype

```
USE IFLPORT
or
INTERFACE
```

```

LOGICAL(4) FUNCTION MAKEDIRQQ(DIRNAME)
CHARACTER(*) DIRNAME
END FUNCTION
END INTERFACE

```

## Usage

```
result = MAKEDIRQQ(DIRNAME)
```

DIRNAME CHARACTER(LEN=\*) . Name and path of the directory you want created.

## Results

MAKEDIRQQ returns .TRUE. if successful; otherwise, .FALSE..

MAKEDIRQQ can create only one directory at a time. You cannot create a new directory and a subdirectory below it in a single command.

MAKEDIRQQ does not translate path delimiters. You can use either slash (/) or backslash (\) as valid delimiters.

If an error occurs, you should call GETLASTERRORQQ to determine the problem. Possible errors include:

ERR\$ACCES	Permission denied. The file's (or directory's) permission setting does not allow the specified access.
ERR\$EXIST	The directory already exists.
ERR\$NOENT	The file or path specified was not found.

## Example

```

USE IFLPORT
LOGICAL(4) result
result = MAKEDIRQQ('mynewdir')
IF (result) THEN
    WRITE (*,*) 'New subdirectory successfully
created'
ELSE
    WRITE (*,*) 'Failed to create subdirectory'
END IF
END

```

## MATHERRQQ

*Handles run-time math errors.*

---

### Prototype

```

INTERFACE
  SUBROUTINE MATHERRQQ( NAME,NLEN,INFO,RETCODE)
    CHARACTER(LEN=*) NAME
    INTEGER(2)  :: NLEN, RETCODE
    STRUCTURE /MTH$E_INFO/
      INTEGER*4 ERRCODE      ! INPUT : One of the MTH$
                             ! values above
      INTEGER*4 FTYPE       ! INPUT : One of the TY$
                             ! values above
    UNION
    MAP
      REAL*4 R4ARG1          ! INPUT : First argument
      CHARACTER*12 R4FILL1
      REAL*4 R4ARG2          ! INPUT : Second argument
                             !(if any)
      CHARACTER*12 R4FILL2
      REAL*4 R4RES           ! OUTPUT : Desired result
      CHARACTER*12 R4FILL3
    END MAP
    MAP
      REAL*8 R8ARG1          ! INPUT : First argument
      CHARACTER*8 R8FILL1
      REAL*8 R8ARG2          ! INPUT : Second argument
                             !(if any)
      CHARACTER*8 R8FILL2
      REAL*8 R8RES           ! OUTPUT : Desired result
      CHARACTER*8 R8FILL3
    END MAP
  END SUBROUTINE MATHERRQQ
END INTERFACE

```



```

MAP
    COMPLEX*8 C8ARG1      ! INPUT : First argument
    CHARACTER*8 C8FILL1
    COMPLEX*8 C8ARG2      ! INPUT : Second argument
                        ! (if any)

    CHARACTER*8 C8FILL2
    COMPLEX*8 C8RES       ! OUTPUT : Desired result
    CHARACTER*8 C8FILL3
END MAP

MAP
    COMPLEX*16 C16ARG1    ! INPUT : First argument
    COMPLEX*16 C16ARG2    ! INPUT : Second argument
                        ! (if any)

    COMPLEX*16 C16RES     ! OUTPUT : Desired result
END MAP

END UNION
END STRUCTURE
RECORD /MTH$E_INFO/ info
END SUBROUTINE
END INTERFACE

```




---

**NOTE.** *Due to the fact that you cannot use old VAX style structures in Fortran 95 MODULEs with Intel Fortran, there is no interface for this function in IFLPORT.F90*

---

## Usage

```
CALL MATHERRQQ (NAME,NLEN,INFO,RETCODE)
```

NAME                    CHARACTER ( LEN= \* ). On return, this variable contains the name of the function causing the error. The parameter NAME is a typeless version of the function called. For example, if an error occurs in a SIN function, the name will be returned as SIN for real arguments and CSIN for complex arguments even though the function

may have actually been called with an alternate name such as DSIN or CDSIN, or with SIN and complex arguments.

NLEN	INTEGER( 2 ). Number of characters returned in NAME.
INFO	UNION containing data about the error. The MTH\$E_INFO union is defined above.
RETCODE	INTEGER( 2 ). Return code passed back to the run-time library. The value of RETCODE should be set by the user's MATHERRQQ routine to indicate whether the error was resolved. Set this value to 0 to indicate that the error was not resolved and that the program should fail with a run-time error. Set it to any nonzero value to indicate that the error was resolved and the program should continue.

The ERRCODE element in the MTH\$E\_INFO structure specifies the type of math error that occurred, and can have one of the following values:

Vlaue	Meaning
MTH\$E_DOMAIN	Argument domain error
MTH\$E_OVERFLOW	Overflow range error
MTH\$E_PLOSS	Partial loss of significance
MTH\$E_SINGULARITY	Argument singularity
MTH\$E_TLOSS	Total loss of significance
MTH\$E_UNDERFLOW	Underflow range error

The FTYPE element of the INFO structure identifies the data type of the math function as TY\$REAL4, TY\$REAL8, TY\$CMPLX4, or TY\$CMPLX8. Internally, REAL( 4 ) and COMPLEX( 4 ) arguments are converted to REAL( 8 ) and COMPLEX( 8 ). In general, a MATHERRQQ function should test the FTYPE value and take separate action for TY\$REAL8 or TY\$CMPLX8 using the appropriate mapped values. If you want to resolve the error, set the R8RES or C8RES field to an appropriate value such as 0.0.

You can do calculations within the `MATHERRQQ` function using the appropriate `ARG1` and `ARG2` fields, but avoid doing any calculations that would cause an error resulting in another call to `MATHERRQQ`.



---

**NOTE.** *You cannot use `MATHERRQQ` in DLLs or in a program that links with a DLL.*

---

---

## NARGS

*Returns the number of arguments on the command line*

---

### Prototype

```
INTERFACE
    INTEGER(4) FUNCTION NARGS ( )
    END FUNCTION NARGS
END INTERFACE
```

### Description

This function returns the number of arguments on the command line, not including the invoking command itself.

### Output

An integer value, zero or positive, indicating the number of arguments on the command line invoking your program.

---

## NUMARG

*Returns the number of arguments on the command line*

---

### Prototype

```
INTERFACE
  INTEGER(4) FUNCTION NUMARG ( )
  END FUNCTION NUMARG
END INTERFACE
```

### Description

This function returns the number of arguments on the command line, not including the invoking command itself.

### Output

An integer value, zero or positive, indicating the number of arguments on the command line invoking your program.

---

## PACKTIMEQQ

*Packs time and date values.*

---

### Prototype

```
USE IFLPORT
or
```

### IA-32 systems

```
INTERFACE
  SUBROUTINE
    PACKTIMEQQ (TIMEDATE, IYR, IMON, IDAY, IHR, IMIN, ISEC)
```

```

    INTEGER(4) TIMEDATE
    INTEGER(2) IYR, IMON, IDAY, IHR, IMIN, ISEC
END SUBROUTINE
END INTERFACE

```

### Itanium-based systems:

```

INTERFACE
  SUBROUTINE
    PACKTIMEQQ(TIMEDATE, IYR, IMON, IDAY, IHR, IMIN, ISEC)
    INTEGER(8) TIMEDATE
    INTEGER(2) IYR, IMON, IDAY, IHR, IMIN, ISEC
  END SUBROUTINE
END INTERFACE

```

### Usage

```

CALL PACKTIMEQQ
  (TIMEDATE, IYR, IMON, IDAY, IHR, IMIN, ISEC)
TIMEDATE      INTEGER(4). Packed time and date information.
IYR           INTEGER(2). Year (xxxx AD).
IMON          INTEGER(2). Month (1 - 12).
IDAY          INTEGER(2). Day (1 - 31)
IHR           INTEGER(2). Hour (0 - 23)
IMIN          INTEGER(2). Minute (0 - 59)
ISEC          INTEGER(2). Second (0 - 59)

```

The packed time is the number of seconds since 00:00:00 Greenwich mean time, January 1, 1970. You can numerically compare packed time items. You can use `PACKTIMEQQ` to work with relative date and time values. Use `UNPACKTIMEQQ` to unpack time information. `SETFILETIMEQQ` uses packed time.

### Example

```

USE IFLPORT
INTEGER(2) year, month, day, hour, minute, second, hund
INTEGER(4) timedate

```

```

      INTEGER(4) y4,m4,d4,h4,s4,hu4
      CALL GETDAT (y4, m4, d4)
      year = y4
      month = m4
      day = d4
      CALL GETTIM (h4, m4, s4, hu4)
      hour = h4
      minute = m4
      second = s4
      hund = hu4
      CALL PACKTIMEQQ (timedate, year, month, day, hour,
& minute, second)
      END

```

---

## PEEKCHARQQ

*Checks the keystroke buffer for a recent console keystroke.*

---

### Prototype

```

      USE IFLPORT
      or
      INTERFACE
      ! TEST FOR CONSOLE INPUT
      LOGICAL(4) FUNCTION PEEKCHARQQ()
      END FUNCTION PEEKCHARQQ
      END INTERFACE

```

### Description

Checks the keystroke buffer for a recent console keystroke and returns `.TRUE.` if there is a character in the buffer or `.FALSE.` if there is not.

## Usage

```
result = PEEKCHARQQ ( )
```

## Results

The result type is LOGICAL(4). The result is .TRUE. if there is a character waiting in the keyboard buffer; otherwise, .FALSE..

To find out the value of the key in the buffer, call GETCHARQQ. If there is no character waiting in the buffer when you call GETCHARQQ, GETCHARQQ waits until there is a character in the buffer. If you call PEEKCHARQQ first, you prevent GETCHARQQ from halting your process while it waits for a keystroke. If there is a keystroke, GETCHARQQ returns it and resets PEEKCHARQQ to .FALSE..

## Example

```
USE IFLPORT
LOGICAL(4) pressed / .FALSE. /
DO WHILE (.NOT. pressed)
    WRITE(*,*) ' Press any key'
    pressed = PEEKCHARQQ ( )
END DO
END
```

---

# PERROR

*Sends a message to standard error*

---

## Prototype

```
INTERFACE
    SUBROUTINE PERROR (STRING)
        CHARACTER(LEN=*) STRING
    END SUBROUTINE PERROR
END INTERFACE
```

STRING                      message to precede the standard error message

## Description

Sends a message to the standard error stream, preceded by the specified STRING.

---

## POPCNT

*Counts the number of 1-bits in the given value*

---

## Prototype

```
INTERFACE
  INTEGER(4) FUNCTION POPCNT (VALUE)
  INTEGER(4), INTENT(IN) :: VALUE
  END FUNCTION POPCNT
END INTERFACE
```

VALUE                      a positive integer value

## Description

This function counts the number of 1-bits in the given value.

## Output

Number of 1-bits.



---

## POPPAR

*Population parity*

---

### Prototype

```
INTERFACE
  INTEGER(4) FUNCTION POPPAR (P)
  TYPE P
  END FUNCTION POPPAR
END INTERFACE
```

TYPE                    may have the following types: BYTE, INTEGER,  
                         INTEGER( 2 ), INTEGER( 4 ), LOGICAL( 1 ),  
                         LOGICAL( 2 ), LOGICAL( 4 ), REAL( 4 ), POINTER

P                        any scalar value up to a maximum of 32 bits in length

### Description

This function returns 0 if the number of bits in the argument is even, 1 if the number is odd.

---

## PUTC

*Writes a character to standard output.*

---

### Prototype

```
INTERFACE
  INTEGER(4) FUNCTION PUTC(CH)
  CHARACTER(LEN=1) CH
  END FUNCTION PUTC
END INTERFACE
```

CH                      a character variable

## Description

Writes a character to the standard output device. Intel Fortran assumes that external unit 6 is connected to the standard output device (`stdout`), which is where your output will be sent. Typically `stdout` is your terminal screen. If unit 6 is connected to some other device, this routine will still send output to the standard output device.

## Output

A zero if successful; otherwise, an error code.

---

## QSORT

*Sorts an array*

---

## Prototype

```

INTERFACE
  SUBROUTINE QSORT(ARRAY, LEN, ISIZE, COMP)
    TYPE ARRAY(LEN)
  INTEGER LEN, ISIZE
  INTERFACE
    INTEGER(2) FUNCTION COMP(P1, P2)
      TYPE P1, P2
    END FUNCTION COMP
  END INTERFACE
  END SUBROUTINE QSORT
END INTERFACE

ARRAY        is a one-dimensional array of any of the following
TYPE        is any intrinsic or derived type
LEN         is the number of elements in the array
ISIZE        is the size in bytes of a single element of the array

```

COMP is a comparison function that you must supply that returns

```
<0, if P1 .LT. P2
=0, if P1 = P2
>0, if P1 .GT. P2
```

### Description

Sorts the given array using the given comparison function.




---

**NOTE.** QSORT *can provide unpredictable results for multi-dimensional arrays. It assumes C language element order and one-dimensional arrays.*

---

### Output

QSORT returns your array sorted in place in ascending order.

---

## RAISEQQ

*Sends a signal to the executing program.*

---

### Prototype

```
USE IFLPORT
or
INTERFACE
  INTEGER(4) FUNCTION RAISEQQ(SIGNUMBER)
    INTEGER(4) SIGNUMBER
  END FUNCTION
END INTERFACE
```

## Usage

```
result = RAISEQQ (SIGNUMBER)
```

**SIGNUMBER**        the number of the signal to raise. One of the following constants (defined in `IFLPORT.F90` )

**SIG\$ABORT**        Abnormal termination

**SIG\$FPE**           Floating-point error

**SIG\$ILL**           Illegal instruction

**SIG\$INT**           CTRL+C signal

**SIG\$SEGV**        Illegal storage access

**SIG\$TERM**        Termination request

If you do not install a signal handler (with `SIGNALQQ`, for example), when a signal occurs the system by default terminates the program.

## Results

The result is zero if successful; otherwise, nonzero.

If a signal-handling routine for **SIGNUMBER** has been installed by a prior call to `SIGNALQQ`, `RAISEQQ` causes that routine to be executed. If no handler routine has been installed, the system terminates the program (the default action).

---

## RAN

*Generates a random number between 0 and 1.*

---

## Prototype

```
INTERFACE
    REAL(4) FUNCTION RAN(ISEED)
    END FUNCTION RAN
END INTERFACE
```

ISEED must be an INTEGER( 4 ) variable or array element. RAN stores a number in ISEED to be used by the next call to RAN. ISEED should initially be set to an odd number, preferably very large; see the Example.

### Description

Generates random numbers between 0 and 1 from an integer seed ISEED. It updates ISEED with the new value of the internal seed. At the first call, it is recommended to initialize ISEED to a large, odd value.

### Class

Elemental nonstandard function.

### Example

```
INTEGER(4) iseed  
REAL(4) rnd  
iseed = 425001  
rnd = RAN(iseed)
```



---

**NOTE.** *To ensure different random values for each run of a program, ISEED should be set to a different value each time the program is run. One way to implement this would be to have the user enter the seed at the start of the program. Another way would be to compute a value from the current year, day, and month (returned by IDATE) and the number of seconds since midnight.*

---

---

## RAND

*Generates a random number in the range of 0.0 to 1.0.*

---

### Prototype

```
INTERFACE
  REAL(4) FUNCTION RAND( ISEED )
    INTEGER(4), INTENT(IN) :: ISEED  !New SEED
  END FUNCTION RAND
  REAL(4) FUNCTION RAND2( )
  END FUNCTION RAND2( )
END INTERFACE
```

### Description

Generate a random number uniformly distributed in the range of 0.0 to 1.0. At the first call, it is recommended to set ISEED to a large, odd value to initialize the internal seed. ISEED is not updated. For subsequent calls, ISEED should be set to zero to get the next random number in the sequence. If ISEED is set to one, the internal seed can also be set by

```
CALL SEED( ISEED ).
```

When RAND called without arguments, ISEED assumed to be 0.

### Class

Elemental nonstandard function.

### Result Type and Parameter Type

REAL(4) type.

### Output

The output depends on the parameter value as follows:

- If the input parameter is equal to zero, RAND returns the next number in the pseudorandom sequence.
- If the input parameter is equal to one, RAND restarts the pseudorandom number sequence and returns the first number of the sequence.
- If the input parameter is greater than one, the value is used as the seed for a new pseudorandom sequence, and RAND returns the first number in that sequence.

### Example

```
INTERFACE
    REAL(4) FUNCTION RAND(ISEED)
    INTEGER(4) ISEED
END INTERFACE
INTEGER(4) ISEED
REAL(4) rv
rv = RAND(ISEED)
END
```



---

**NOTE.** *For details about restarting the pseudorandom number generator used by IRAND and RAND, see the “SRAND” section.*

---

---

## RANDOM

*Random number generator*

---

### Prototype

```
INTERFACE
    SUBROUTINE RANDOM (R)
    REAL (4) R
END SUBROUTINE RANDOM
```

```
END INTERFACE
```

R                      a REAL ( 4 ) variable or array element that will contain the random number on return

## Description

RANDOM generates a pseudo-random number, based upon the value of the seed set by the RANSET function. Portability functions RANDOM, RAND, and DRAND all generate the same results. A given seed will always generate the same sequence of pseudo-random numbers. RANDOM is an implementation of the algorithm described in *Random Number Generators: Good ones are hard to find*, by Park, S.K., and Miller, K.W., in Comm ACM, Oct. 1988, 1192-1201. This is also described in section 7 of Numerical Recipes. This routine is provided for compatibility with legacy FORTRAN programs. You should use the RANDOM\_NUMBER and RANDOM\_SEED intrinsic functions that are standard Fortran when possible.

## Output

Random real number.

---

## RANDU

*Generates a pseudorandom number in the range 0.0 to 1.0.*

---

## Prototype

```
INTERFACE
  REAL(4) FUNCTION RANDU (IL, I2, X)
  END FUNCTION RANDU
END INTERFACE
```



`IL, I2` must be `INTEGER(2)` variables or array elements that contain the `SEED` for computing the random number. These values are updated during the computation so that they contain the updated seed.

`X` A `REAL(4)` variable or array element where the computed random number is returned.

## Result

The result is returned in `X`, which must be of type `REAL(4)`. The result value is a pseudorandom number in the range 0.0 to 1.0.

The algorithm for computing the random number value is based on the values for `IL` and `I2`.

If `IL=0` and `I2=0`, the generator base is set as follows:

$$X(N + 1) = 2^{16} + 3$$

Otherwise, it is set as follows:

$$X(N + 1) = (2^{16} + 3) * X(N) \bmod 2^{32}$$

The generator base `X(N + 1)` is stored in `IL, I2`.

The result is  $X(N + 1)$   
 scaled to a real value  $Y(N + 1)$ ,  
 for  $0.0 \leq Y(N + 1) < 1$ .

## Example

```
REAL X
INTEGER(2) I, J
...
CALL RANDU (I, J, X)
```

If `I` and `J` are values 4 and 6, `X` stores the value 5.4932479E-04.

---

## RANF

*Generates a random number between 0. and RAND\_MAX.*

---

### Prototype

```
INTERFACE
    REAL(4) FUNCTION RANF ( )
    END FUNCTION RANF
END INTERFACE
```

### Description

RANF returns a single-precision pseudo-random number between 0.0 and RAND\_MAX as defined in the C library, normally  $0x7FFF \cdot 2^{15}-1$ . The initial seed is set by

```
CALL SRAND( ISEED )
```

### Output

A random number of the type REAL( 4 ). ISEED is of INTEGER( 4 ).

---

## RANGET

*Returns the current seed*

---

### Prototype

```
INTERFACE
    SUBROUTINE RANGET (S)
    INTEGER(4) S
    END SUBROUTINE RANGET
END INTERFACE
```

**Description**

RANGET returns the current seed used for a sequence of psuedo-random numbers.

**Output**

The internal seed. This routine is not thread-safe.

---

**RANSET**

*Sets the seed for the random number generator*

---

**Prototype**

```
INTERFACE
  SUBROUTINE RANSET ( ISEED )
    REAL(4) ISEED
  END SUBROUTINE RANSET
END INTERFACE
```

**Description**

Sets the seed for a sequence of pseudo-random numbers.

**Output**

A changed seed.

---

**RENAME**

*Renames a file*

---

**Prototype**

```
INTERFACE
```

```

      FUNCTION RENAME ( FROM , TO )
      CHARACTER ( LEN = * ) FROM , TO
      END FUNCTION RENAME
END INTERFACE

```

FROM                    a character path name of the origin file

TO                      a character path name that specifies the name and  
location where you wish to place the FROM file

## Description

This routine renames a file. Either FROM or TO may include a fully qualified or relative path name. RENAME accepts either forward or backward slashes as directory separators, and converts them to the form appropriate for the host operating system. On NT, you may include drive letters in the path also. Drive letters are not accepted on UNIX systems.

The FROM file must exist when rename is called, but you do not have to have it connected to a logical unit.




---

**NOTE.** *The FROM and TO paths for the files must be on the same physical device. You cannot use this routine to move a file from one device to another.*

---

This routine is thread-safe, and locks the associated stream before I/O is performed.

## Output

A zero status is returned for success, non-zero for failure.

---

## RENAMEFILEQQ

*Renames a file.*

---

### Prototype

```
USE IFLPORT
or
INTERFACE
    LOGICAL(4) FUNCTION RENAMEFILEQQ(OLDNAME,NEWNAME)
        CHARACTER(LEN=*) OLDNAME,NEWNAME
    END FUNCTION RENAMEFILEQQ
END INTERFACE
```

### Usage

```
result = RENAMEFILEQQ (OLDNAME,NEWNAME)
```

OLDNAME            CHARACTER(LEN=\*) . File to be renamed.

NEWNAME            CHARACTER(LEN=\*) . New name of the file to be renamed.

### Results

The result is .TRUE. if successful; otherwise, .FALSE..

You can use RENAMEFILEQQ to move a file from one directory to another on the same drive by giving a different path in the NEWNAME parameter.

If the function fails, you should call GETLASTERRORQQ to determine the reason. One of the following errors can be returned:

ERR\$ACCES	Permission denied. The file's permission setting does not allow the specified access.
ERR\$EXIST	The file already exists.
ERR\$NOENT	File or path specified by OLDNAME not found.
ERR\$XDEV	Attempt to move a file to a different device.

## Example

```
USE iflport
INTEGER(4) len
CHARACTER(80) oldname, newname
LOGICAL(4) result
WRITE(*,'(A)') ' Enter old name: '
len = GETSTRQQ(oldname)
WRITE(*,'(A)') ' Enter new name: '
len = GETSTRQQ(newname)
result = RENAMEFILEQQ(oldname, newname)
END
```

---

## RINDEX

*Locates the index of the last occurrence  
of a substring within a string*

---

## Prototype

```
INTERFACE
  INTEGER(4) FUNCTION RINDEX (S1, S2)
    CHARACTER(LEN=*) S1, S2
  END FUNCTION RINDEX
END INTERFACE
```

S1	original string to search
S2	string to search for

## Description

This function locates the index of the last occurrence of a substring within a string.

## Output

Starting position of the final occurrence of S2 in S1.

---

## RUNQQ

*Executes another program and waits for it to complete.*

---

### Prototype

```
USE IFPORT
or
INTEGER(2) FUNCTION RUNQQ(PROGNAME,COMMANDLINE)
    CHARACTER(LEN=*) PROGNAME, COMMANDLINE
END FUNCTION
```

### Usage

```
result = RUNQQ (FILENAME, COMMANDLINE)
```

FILENAME        Input. CHARACTER (LEN= \* ). Filename of a program to be executed.

COMMANDLINE    Input. CHARACTER (LEN= \* ). Command-line arguments passed to the program to be executed.

### Results

The result type is INTEGER ( 2 ). If the program executed with RUNQQ terminates normally, the exit code of that program is returned to the program that launched it. If the program fails, -1 is returned.

The RUNQQ function executes a new process for the operating system using the same path, environment, and resources as the process that launched it. The launching process is suspended until execution of the launched process is complete.

## Example

```
USE IFLPORT
INTEGER(2) result
result = RUNQQ('dir', '/Os')
END
```

---

## SCWRQQ

*Returns the floating-point processor control word.*

---

## Prototype

```
USE IFLPORT
or
      INTERFACE
      SUBROUTINE SCWRQQ(CONTROL)
            INTEGER(2) CONTROL
      END SUBROUTINE
      END INTERFACE
```

## Usage

```
CALL SCWRQQ (CONTROL)
```

CONTROL      Output. INTEGER(2). Floating-point processor control word.

SCRWQQ performs the same function as GETCONTROLFPQQ, and is provided for compatibility.



---

## SCANENV

*Scans the environment for environment variable.*

---

### Prototype

```
INTERFACE
  SUBROUTINE SCANENV (ENVNAME, ENVTEXT, ENVVALUE)
    CHARACTER (LEN=*) INTENT (IN) :: ENVNAME
    CHARACTER (LEN=*) INTENT (OUT) :: ENVTEXT, ENVVALUE
  END SUBROUTINE SCANENV
END INTERFACE
```

ENVNAME	a CHARACTER variable containing the name of an environment variable you need to find the value for.
ENVTEXT	set to the full text of the environment variable found, or to a “ ” if nothing is found.
ENVVALUE	set to the value associated with the environment found or “ ” if nothing is found.

### Description

Scans the environment for an environment variable that matches ENVNAME and returns the value or string it is set to.

### Output

The text string or the value of the environment variable.

---

## SEED

*Sets the starting point for the random number generator*

---

### Prototype

```
INTERFACE
  SUBROUTINE SEED ( ISEED )
    INTEGER(4) ISEED
  END SUBROUTINE SEED
END INTERFACE
```

### Description

Sets the internal seed for a sequence of pseudo-random numbers.

### Output

A changed seed. This routine is not thread-safe.

---

## SECNDS

*Returns the number of seconds since last call*

---

### Prototype

```
INTERFACE
  REAL(4) FUNCTION SECNDS( TIME )
    REAL(4) TIME
  END FUNCTION SECNDS
END INTERFACE
```

TIME	0.0 to start the clock, or the last value returned from SECNDS
------	--

## Description

This function returns the elapsed time in seconds since the last call to `SECNDS`, or the number of seconds since midnight if the parameter is 0.0.

## EXAMPLE

```
PROGRAM TIMEIT
REAL STARTTIME,STOPTIME
STARTTIME= SECNDS(0.0)
DO 10 I = 1,1000000
  I = I +1
10 CONTINUE
STOPTIME= SECNDS(STARTTIME)
PRINT *, 'Elapsed time was: ',STOPTIME
END
```

We provide this routine for compatibility with other FORTRAN compilers. You can time a section of your code's execution, or time your whole program. You can also time sections of your program and add the times together. This routine is primarily useful in benchmarking, or as a rough profiling guide of where your application spends most of its execution time.

To start the timing clock, call `SECNDS` with 0.0, and save the result in a local variable. To get the elapsed time since the last call to `SECNDS`, pass the local variable to `SECNDS` on the next call.

This routine is thread-safe.

## Output

The elapsed time in whole seconds since midnight, or since midnight minus the value of the supplied floating point argument. If you want more accurate timing, see the subroutine `DCLOCK`.

## SETCONTROLFPQQ

*Sets the value of the floating-point processor control word.*

---

### Prototype

```
USE IFLPORT
or
INTERFACE
  SUBROUTINE SETCONTROLFPQQ( CONTROL )
    INTEGER( 2 ) CONTROL
  END SUBROUTINE
END INTERFACE
```

### Usage

```
CALL SETCONTROLFPQQ ( CONTROLWORD )
```

CONTROLWORD    INTEGER( 2 ). Floating-point processor control word.

The floating-point control word allows you to specify how various exception conditions are handled by the floating-point math coprocessor. You can also set the floating-point precision, and specify the floating-point rounding mechanism used.

The IFLPORT.F90 module file contains constants defined for the control word as follows:

Parameter Name	Hex Value	Description
FPCW\$MCW_IC	Z'1000'	<b>Infinity control mask</b>
FPCW\$AFFINE	Z'1000'	Affine infinity
FPCW\$PROJECTIVE	Z'0000'	Projective infinity
FPCW\$MCW_PC	Z'0300'	<b>Precision control mask</b>
FPCW\$64	Z'0300'	64-bit precision
FPCW\$53	Z'0200'	53-bit precision

Parameter Name	Hex Value	Description
FPCW\$24	Z'0000'	24-bit precision
FPCW\$MCW_RC	Z'0C00'	<b>Rounding control mask</b>
FPCW\$CHOP	Z'0C00'	Truncate
FPCW\$UP	Z'0800'	Round up
FPCW\$DOWN	Z'0400'	Round down
FPCW\$NEAR	Z'0000'	Round to nearest
FPCW\$MCW_EM	Z'003F'	<b>Exception mask</b>
FPCW\$INVALID	Z'0001'	Allow invalid numbers
FPCW\$DENORMAL	Z'0002'	Allow denormals (very small numbers)
FPCW\$ZERODIVIDE	Z'0004'	Allow divide by zero
FPCW\$OVERFLOW	Z'0008'	Allow overflow
FPCW\$UNDERFLOW	Z'0010'	Allow underflow
FPCW\$INEXACT	Z'0020'	Allow inexact precision

The defaults for the floating-point control word are 53-bit precision, round to nearest, and the denormal, underflow and inexact precision exceptions disabled. An exception is disabled if its flag is set to 1 and enabled if its flag is cleared to 0.

Setting the floating-point precision and rounding mechanism can be useful if you are reusing old code that is sensitive to the floating-point precision standard used and you want to get the same results as on the old machine.

You can use `GETCONTROLFPQQ` to retrieve the current control word and `SETCONTROLFPQQ` to change the control word. If you need to change the control word, always use `SETCONTROLFPQQ` to make sure that special routines handling floating-point stack exceptions and abnormal propagation work correctly.

### Example

```
USE IFLPORT
INTEGER(2) status, control, controlo
```

```

CALL GETCONTROLFPQQ(control)
WRITE (*, 9000) 'Control word: ', control
!      Save old control word controlo = control
!      Clear all flags control = control .AND. Z'0000'
!      Set new control to round up
control = control .OR. FPCW$UP
CALL SETCONTROLFPQQ(control)
CALL GETCONTROLFPQQ(control)
WRITE (*, 9000) 'Control word: ', control
9000 FORMAT (1X, A, Z4)
END

```

---

## SETDAT

*Sets the current system date in years,  
months, and day*

---

### Prototype

```

INTERFACE SETDAT
  LOGICAL(4) FUNCTION SETDAT(YEAR,MONTH,DAY)
    INTEGER(4) :: YEAR,MONTH,DAY! YEAR IS 4 DIGITS
  END FUNCTION
  LOGICAL(4) FUNCTION SETDAT_DVF(YEAR,MONTH,DAY)
    INTEGER(2) :: YEAR,MONTH,DAY !YEAR is 4 digits
  END FUNCTION
END INTERFACE

```

YEAR	4-digit integer
MONTH	between 1-12
DAY	between 1-31

**Description**

This subroutine sets the current system date in years, months, and day. If the values are not valid, the date is not set.

**Output**

Changed date on the system executing the program.

---

**SETENVQQ**

*Sets the value of an existing environment variable.*

---

**Prototype**

```
USE IFLPORT
or
LOGICAL(4) FUNCTION SETENVQQ( INPUT_STRING )
    CHARACTER(LEN=*) INPUT_STRING
END FUNCTION SETENVQQ
```

**Description**

Sets the value of an existing environment variable, or adds and sets a new environment variable.

**Usage**

```
result = SETENVQQ (INPUT_STRING)

INPUT_STRING CHARACTER(LEN=*) . String containing both the name
and the value of the variable to be added or modified.
Must be in the form: VARNAME = VALUE, where
VARNAME is the name of an environment variable and
value is the value being assigned to it.
```

## Results

The result is `.TRUE.` if successful; otherwise, `.FALSE.`

Environment variables define characteristics of the environment in which a program executes. For example, the `LIB` environment variable defines the default search path for libraries to be linked with a program.

`SETENVQQ` deletes any terminating blanks in `INPUT_STRING`. Although the equal sign (`=`) is an illegal character within an environment value, you can use it to terminate `VALUE` so that trailing blanks are preserved. For example, the string `PATH=`  sets *value* to `"`.

You can use `SETENVQQ` to remove an existing variable by giving a variable name followed by an equal sign with no value. For example, `LIB=` removes the variable `LIB` from the list of environment variables. If you specify a value for a variable that already exists, its value is changed. If the variable does not exist, it is created.

`SETENVQQ` affects only the environment that is local to the current process. You cannot use it to modify the command-level environment. When the current process terminates, the environment reverts to the level of the parent process. In most cases, this is the operating system level. However, you can pass the environment modified by `SETENVQQ` to any child process created by `RUNQQ`, `PXFFORK`, or other means of creating a child process.. These child processes get new variables and/or values added by `SETENVQQ`.

## Example

```
USE IFLPORT
! Note, compile this example with /nbs
LOGICAL(4) success
success = SETENVQQ("PATH=c:\users\mjsmith\bin")
success = &
SETENVQQ("LIB=c:\program
files\intel\compiler4.5\lib")
PRINT *, SUCCESS
END
```



---

## SETERRORMODEQQ

*Sets the prompt mode for critical errors.*

---

### Prototype

```
USE IFLPORT
or
INTERFACE
    SUBROUTINE SETERRORMODEQQ ( PROMPT )
        LOGICAL ( 4 ) PROMPT
    END SUBROUTINE
END INTERFACE
```

### Description

Sets the prompt mode for critical errors that by default generate system prompts.

### Usage

```
CALL SETERRORMODEQQ ( PROMPT )
```

PROMPT            LOGICAL ( 4 ) . PROMPT determines whether a prompt is displayed when a critical error occurs.

Certain I/O errors cause the system to display an error prompt. For example, attempting to write to a disk drive with the drive door open generates an "Abort, Retry, Ignore" message. When your program begins execution, system error prompting is enabled by default. You can enable system error prompts by calling SETERRORMODEQQ with PROMPT set to ERR\$HARDPROMPT (defined in IFLPORT.F90).

If you disable prompting, serious I/O errors that would normally result in a prompt are silent.

Errors in I/O statements such as OPEN, READ, and WRITE fail immediately instead of being interrupted with prompts. This gives you more direct control of what happens when there is an error. You can use the ERR= facility of many I/O statements to give a label to branch to for error handling .

You can turn off prompt mode by setting PROMPT to .FALSE. or to the constant ERR\$HARDFAIL (defined in IFLPORT.F90). You should be aware that SETERRORMODEQQ affects only errors that generate a system prompt. It does not affect other I/O errors, such as writing to a nonexistent file or attempting to open a nonexistent file with STATUS='OLD'.

## Example 1

```
!PROGRAM 1
!  DRIVE B door open
! Note: you should compile these examples with /nbs
OPEN (10, FILE = 'B:\NOFILE.DAT', ERR = 100)
!  Generates a system prompt error here and waits for
! the user to respond to the prompt before continuing
100  WRITE(*,*) ' Continuing'
END
```

## Example 2

```
! PROGRAM 2
!  DRIVE B door open
! Note: you should compile these examples with /nbs
USE IFLPORT
CALL SETERRORMODEQQ(.FALSE.)
OPEN (10, FILE = 'B:\NOFILE.DAT', ERR = 100)
!  Causes the statement at label 100 to execute
!  without system prompt
100  WRITE(*,*) ' Drive B: not available, opening
& &alternative drive.'
OPEN (10, FILE = 'C:\NOFILE.DAT')
END
```

---

## SETFILETIMEQQ

*Sets the modification time for a specified file.*

---

### Prototype

```
USE IFLPORT
```

```
or :
```

### IA-32 systems:

```
INTERFACE
```

```
    LOGICAL(4) FUNCTION SETFILETIMEQQ(NAME, TIMEDATE)
```

```
        CHARACTER(LEN=*) NAME
```

```
        INTEGER(4) TIMEDATE
```

```
    END FUNCTION
```

```
END INTERFACE
```

### Itanium™-based systems:

```
INTERFACE
```

```
    LOGICAL(4) FUNCTION SETFILETIMEQQ(NAME, TIMEDATE)
```

```
        CHARACTER(LEN=*) NAME
```

```
        INTEGER(8) TIMEDATE
```

```
    END FUNCTION
```

```
END INTERFACE
```

### Usage

```
result = SETFILETIMEQQ (NAME, TIMEDATE)
```

NAME                    CHARACTER(LEN=\*) . Name of a file.

TIMEDATE                INTEGER(4) . Time and date information, as packed by  
                         PACKTIMEQQ.

### Results

The result is .TRUE. if successful; otherwise, .FALSE..

The modification time is the time the file was last modified. The process that calls SETFILETIMEQQ must have write access to the file; otherwise, you cannot change the time. If you set TIMEDATE to FILE\$CURTIME (defined in IFLPORT.F90), SETFILETIMEQQ sets the modification time to the current system time.

If the function fails, call GETLASTERRORQQ to determine the reason, which can be one of the following:

Error	Meaning
ERR\$ACCES	Permission denied. The file's (or directory's) permission setting does not allow the specified access.
ERR\$INVAL	Invalid argument; TIMEDATE argument is invalid.
ERR\$MFILE	Too many open files (the file must be opened to change its modification time).
ERR\$NOENT	File or path not found.
ERR\$NOMEM	Not enough memory is available to execute the command; or the available memory has been corrupted; or an invalid block exists, indicating that the process making the call was not allocated properly.

## Example

```

USE IFLPORT
INTEGER(2) day, month, year
INTEGER(2) hour, minute, second, hund
INTEGER(4) timedate
INTEGER(4) hr1, mn1, sel, hul, yel, mol, dal
LOGICAL(4) result
CALL GETDAT(yel, mol, dal)
year = yel
month = mol
day = dal
CALL GETTIM(hr1, mn1, sel, hul)
hour = hr1
minute = mn1

```

```
second = sel
hund = hul
CALL PACKTIMEQQ (timedate, year, month, day,    &
                 hour, minute, second)
result = SETFILETIMEQQ('myfile.dat', timedate)
PRINT *, RESULT
END
```

---

## SETTIM

*Sets the current system date in years,  
months, and days*

---

### Prototype

```
INTERFACE SETTIM
  LOGICAL(4) FUNCTION SETTIM (HOUR,MINUTE, &
                              SECOND,HUNDRETH)
    INTEGER(4), INTENT(IN) :: HOUR,MINUTE, &
                              SECOND,HUNDRETH
  END FUNCTION
  LOGICAL(4) FUNCTION SETTIM_DVF (HOUR,MINUTE, &
                                  SECOND,HUNDRETH)
    INTEGER(2), INTENT(IN) :: HOUR,MINUTE, &
                                  SECOND,HUNDRETH
  END FUNCTION
END INTERFACE

HOUR           between 0 - 23
MINUTE         between 0 - 59
SECOND         between 0 - 59
HUNDREDDTH    between 0 - 99
```

## Description

This subroutine sets the current system time in hours, minutes, seconds and hundredths of a second. If the values are not valid, the time is not set.

## Output

Changed current time on the system executing the program.

---

## SHIFTL

*Shifts a value to the left by a specified number of bit positions*

---

## Prototype

```
INTERFACE
    INTEGER(4) FUNCTION SHIFTL( IVALUE, ISHIFTCOUNT )
    INTEGER(4) IVALUE, ISHIFTCOUNT
    END INTEGER FUNCTION SHIFTL
END INTERFACE
```

IVALUE            an integer value

ISHIFTCOUNT    the number of bit positions to shift. Must be positive  
INTEGER( 4 ) expression

## Description

This is an arithmetic shift. A shift count greater than the size in bits of the input value returns a result of zero.

This routine is thread-safe.

## Output

The input value is shifted left by ISHIFTCOUNT bit positions.

---

## SHIFTR

*Shifts a value to the right by a specified number of bit positions*

---

### Prototype

```
INTERFACE
    INTEGER(4) FUNCTION SHIFTR( IVALUE, ISHIFTCOUNT )
    INTEGER(4) IVALUE, ISHIFTCOUNT
    END INTEGER FUNCTION SHIFTR
END INTERFACE
```

IVALUE            an integer value

ISHIFTCOUNT      the number of bit positions to shift. Must be positive  
                 INTEGER( 4 ) expression

### Description

This is an arithmetic shift. A shift count greater than the size in bits of the input value returns a result of zero.

This routine is thread-safe.

### Output

The input value is shifted right by ISHIFTCOUNT bit positions.

## SIGNALQQ

*Registers the function to be called if an interrupt signal occurs.*

---

### Prototype

```
USE IFLPORT
```

or

### IA-32 systems

```
INTERFACE
```

```
    INTEGER(4) FUNCTION SIGNALQQ(SIGNAL, HANDLER)
```

```
        INTEGER(4) SIGNAL
```

```
        INTEGER(4) HANDLER
```

```
        EXTERNAL HANDLER
```

```
    END FUNCTION
```

```
END INTERFACE
```

### Itanium™-based systems

```
INTERFACE
```

```
    INTEGER(8) FUNCTION SIGNALQQ(SIGNAL, HANDLER)
```

```
        INTEGER(4) SIGNAL
```

```
        INTEGER(8) HANDLER
```

```
        EXTERNAL HANDLER
```

```
    END FUNCTION
```

```
END INTERFACE
```

### Usage

```
result = SIGNALQQ (SIGNAL,HANDLER)
```

SIGNAL            INTEGER(4). Interrupt type. You should specify one of the following constants, defined in IFLPORT.F90:

SIG\$ABORT        Abnormal termination

SIG\$FPE          Floating-point error



	<code>SIG\$ILL</code>	Illegal instruction
	<code>SIG\$INT</code>	CTRL+C SIGNAL
	<code>SIG\$SEGV</code>	Illegal storage access
	<code>SIG\$TERM</code>	Termination request
HANDLER	CHARACTER ( LEN=* ). You should give a name of function to be executed on interrupt. The function must exist.	

## Results

The result is a positive integer if successful; otherwise, -1 (`SIG$ERR`).

`SIGNALQQ` establishes the function `HANDLER` as the handler for a signal of the type specified by `SIGNAL`. If you do not establish a handler, the program terminates when an interrupt signal occurs.

The argument `HANDLER` is the name of a function and must be declared with either the `EXTERNAL` or `IMPLICIT` statements, or have an explicit interface. A function described in an `INTERFACE` block is `EXTERNAL` by default, and does not need to be declared `EXTERNAL`.

When an interrupt occurs, except a `SIG$FPE` interrupt, the `SIGNAL` argument `SIG$INT` is passed to `HANDLER`, and then `HANDLER` is executed.

When a `SIG$FPE` occurs, the function `HANDLER` is passed two arguments: `SIG$FPE` and the floating-point error code (for example, `FPE$ZERODIVIDE` or `FPE$OVERFLOW`) which identifies the type of floating-point exception that occurred. The floating-point error codes begin with the prefix `FPE$` and are defined in `IFLPORT.F90`.

If `HANDLER` returns, the calling process resumes execution immediately after the point where it received the interrupt signal. This is true regardless of the type of signal or operating mode.

Because signal-handler routines are normally called asynchronously when an interrupt occurs, it is possible that your signal-handler function will get control when a run-time operation is incomplete and in an unknown state. Therefore, in a signal handler routine, you should not call heap routines or any routine that uses the heap routines (for example, I/O routines, `ALLOCATE`, and `DEALLOCATE`).

To test your signal handler routine you can generate interrupt signals by calling `RAISEQQ`, which causes your program either to branch to the signal handlers set with `SIGNALQQ`, or to perform the system default behavior if `SIGNALQQ` has set no signal handler.

The example below demonstrates a signal handler for `SIG$ABORT`.

## Example

```
! This program shows a signal handler for
! SIG$ABORT
USE IFLPORT
INTERFACE
    FUNCTION h_abort (signum)
        INTEGER(4) h_abort
        INTEGER(2) signum
    END FUNCTION
END INTERFACE
INTEGER(2) i2ret
INTEGER(4) i4ret
i4ret = SIGNALQQ(SIG$ABORT, h_abort)
WRITE(*,*) 'Set signal handler. Return = ', i4ret
i2ret = RAISEQQ(SIG$ABORT)
WRITE(*,*) 'Raised signal. Return = ', i2ret
END

! Signal handler routine
INTEGER(4) FUNCTION h_abort (signum)
    INTEGER(2) signum
    WRITE(*,*) 'In signal handler for SIG$ABORT'
    WRITE(*,*) 'signum = ', signum
    h_abort = 1
END
```

---

## SLEEP

*Suspends execution of a process for a specified interval*

---

### Prototype

```
INTERFACE
  SUBROUTINE SLEEP (TIME)
    INTEGER(4) TIME
  END SUBROUTINE SLEEP
END INTERFACE
```

TIME                    Length of time, in seconds, to suspend the calling process.

### Description

This function suspends the execution of a process for a specified interval.

### Output

None.

---

## SLEEPQQ

*Delays execution of the program for a specified duration.*

---

### Prototype

```
USE IFLPORT
or
INTERFACE
  SUBROUTINE SLEEPQQ( DURATION)
```

```
        INTEGER(4) DURATION
    END SUBROUTINE
END INTERFACE
```

## Usage

```
CALL SLEEPQQ (DURATION)

DURATION      INTEGER(4). Number of milliseconds the program is
                to sleep (delay program execution).
```

## Example

```
USE IFLPORT
INTEGER(4) delay, freq, duration
delay      = 2000
freq       = 4000
duration   = 1000
CALL SLEEPQQ(delay)
CALL BEEPQQ(freq, duration)
END
```

---

## SPLITPATHQQ

*Breaks a file path or directory path into  
its components.*

---

## Prototype

```
USE IFLPORT
or
INTERFACE
    INTEGER(4) FUNCTION SPLITPATHQQ(PATH, DRIVE, DIR,
        NAME, EXT)
        CHARACTER(LEN=*) NAME, EXT, PATH, DRIVE, DIR
    END FUNCTION
```

```
END INTERFACE
```

## Usage

```
result = SPLITPATHQQ (PATH,DRIVE,DIR,NAME,EXT)
```

PATH	CHARACTER (LEN=*) . Path that you want to break into components. Forward slashes (/), backslashes (\), or both can be present in PATH.
DRIVE	CHARACTER (LEN=*) . Drive letter designation followed by a colon.
DIR	CHARACTER (LEN=*) . Path of directories, including the trailing slash.
NAME	CHARACTER (LEN=*) . Name of file or, if no file is specified in PATH, name of the lowest directory. If a filename, does not include an extension.
EXT	CHARACTER (LEN=*) . Filename extension, if any, including the leading period (.).

## Results

The result is the length of DIR.

PATH can be a complete or partial file specification.

MAXPATH is a symbolic constant defined in module IFLPORT.F90 as 260.

## Example

```
USE IFLPORT
CHARACTER(MAXPATH) buf
CHARACTER(3)        drive
CHARACTER(256)      dir
CHARACTER(256)      name
CHARACTER(256)      ext
CHARACTER(256)      file
INTEGER(4)          length

! Note, this example should be compiled with /nbs
buf = 'b:\fortran\test\runtime\tsplit.for'
length = SPLITPATHQQ(buf, drive, dir, name, ext)
```

```
WRITE(*,*) drive, dir, name, ext
file = 'partial.f90'
length = SPLITPATHQQ(file, drive, dir, name, ext)
WRITE(*,*) drive, dir, name, ext
END
```

---

## SRAND

*Restart the pseudorandom number generator used by IRAND and RAND.*

---

### Prototype

```
INTERFACE
  SUBROUTINE SRAND (NEW_ISEED)
    INTEGER(4), INTENT(IN) :: NEW_SEED
  END SUBROUTINE SRAND
END INTERFACE
```

**NEW\_SEED**      Must be of INTEGER(4) type. The same value for ISEED generates the same sequence of random numbers. To vary the sequence, call SRAND with a different ISEED value each time the program is executed. The default for ISEED is 1.

### Description

Restart the pseudorandom number generator used by IRAND and RAND.

### Class

Specific nonstandard subroutine.

### Example

```
CALL SRAND(5041)
```

---

## SSWRQQ

*Returns the floating-point processor status word.*

---

### Prototype

```
USE IFLPORT
or
INTERFACE
  SUBROUTINE SSWRQQ(STATUS)
    INTEGER(2) STATUS
  END SUBROUTINE
END INTERFACE
```

### Usage

```
CALL SSWRQQ (STATUS)

STATUS      INTEGER(2). Floating-point co-processor status word.

SSWRQQ performs the same function as GETSTATUSFPQQ and is provided
for compatibility.
```

### Example

```
USE IFLPORT
INTEGER(2) status
CALL SSWRQQ (status)
PRINT 10,STATUS
10 FORMAT("FP Status word was ",Z)
END
```

## STAT

*Gets system information on a given file*

---

### Prototype

#### IA-32 systems

```
INTERFACE
  INTEGER(4) FUNCTION STAT(NAME, STARRAY)
    CHARACTER(LEN=*) :: NAME
    INTEGER(4), DIMENSION(12) :: STARRAY
  END FUNCTION
  INTEGER(4) FUNCTION STATI8(NAME, STARRAY)
    CHARACTER(LEN=*) :: NAME
    INTEGER(8), DIMENSION(12) :: STARRAY
  END FUNCTION
END INTERFACE
```

#### Itanium™-based systems

```
INTERFACE STAT
  INTEGER(4) FUNCTION STATI8(NAME, STARRAY)
    CHARACTER(LEN=*) :: NAME
    INTEGER(8), DIMENSION(12) :: STARRAY
  END FUNCTION
END INTERFACE
```

NAME	a CHARACTER variable that specifies a pathname for the file that you want to check.
STATARRAY	an integer array where system information about your file can be placed

### Description

The filename must be currently connected to a logical unit, and must already exist when `stat` is called.



This routine is thread-safe, and locks the associated stream before information is collected.




---

**NOTE.** *On NT, stat and lstat are equivalent. On UNIX, if the file denoted by NAME is a link, lstat provides information on the link, while stat provides information on the file at the destination of the link.*

---

## Output

Errno set on failure, otherwise, STATARRAY filled in with information about the file. The contents of the STATARRAY on return are system dependent.

stat(1)	Device that specifies the inode or handle	(always 0 on NT)
stat(2)	Inode or handle number	(always 0 on NT)
stat(3)	Protection level	
stat(4)	Number of hard links to file	(always 1 on NT)
stat(5)	User ID of owner	(always 1 on NT)
stat(6)	Group ID of owner	(always 1 on NT)
stat(7)	Device type, if this inode is a device	(always 0 on NT)
stat(8)	Total size of file	
stat(9)	File last access time	(for NT, only if file system non-FAT)
stat(10)	File last modify time	
stat(11)	File last status change time	(for NT, same as stat(10))
stat(12)	Optimal blocksize for file system I/O ops	(always 1 on NT)
stat(13)	Actual number of blocks allocated	(Unix only, not present on NT)

---

## SYSTEM

*Sends a command to the shell for execution*

---

### Prototype

```
INTERFACE
  INTEGER FUNCTION SYSTEM (COMMANDA)
  CHARACTER(LEN=*) COMMANDA
  END FUNCTION SYSTEM
END INTERFACE
```

COMMANDA          command to execute

### Description

This function sends a command to the shell for execution as if it were typed on the command line.

### Output

Exit status of the shell command.

---

## SYSTEMQQ

*Executes a system command.*

---

### Prototype

```
USE IFLPORT
or
INTERFACE
  LOGICAL(4) FUNCTION SYSTEMQQ(COMMANDA)
  CHARACTER(LEN=*) COMMANDA
```

```

        END FUNCTION SYSTEMQQ
END INTERFACE

```

## Description

Executes a system command by passing a command string to the operating system's command interpreter.

## Usage

```

result = SYSTEMQQ (COMMANDA)

```

COMMANDA      CHARACTER ( LEN= \* ). Text of the command line to be passed to the operating system.

## Results

The result is `.TRUE.` if successful; otherwise, `.FALSE.`

The `SYSTEMQQ` function lets you pass command shell commands as well as programs. `SYSTEMQQ` refers to the `COMSPEC` and `PATH` environment variables that locate the command interpreter file (usually named `COMMAND.COM`).

On Windows NT systems, the calling process waits until the command terminates. On Windows 95 and Windows 98 systems, the calling process does not currently wait in all cases; however, this may change in future implementations. To insure compatibility and consistent behavior, an image can be invoked directly by using the WIN32 API `CreateProcess ( )` in your Fortran code.

If the function fails, you can call `GETLASTERRORQQ` to determine the reason. One of the following errors will be returned:

<code>ERR\$2BIG</code>	The argument list exceeds 128 bytes, or the space required for the environment formation exceeds 32K.
<code>ERR\$NOINT</code>	The command interpreter cannot be found.
<code>ERR\$NOEXEC</code>	The command interpreter file has an invalid format and is not executable.

**ERR\$NOMEM** Not enough memory is available to execute the command; or the available memory has been corrupted; or an invalid block exists, indicating that the process making the call was not allocated properly.

The command line character limit for the `SYSTEMQQ` function is the same limit that your command shell accepts.

## Example

```
USE IFLPORT
! Note : compile this example with /nbs
LOGICAL(4) RESULT
RESULT = SYSTEMQQ('dir "c:\program files"')
PRINT *, '*****'
PRINT *, 'Result returned from SYSTEMQQ was ',RESULT
END
```

---

## TIME

*Returns the current time*

---

### Prototype

```
INTERFACE
  SUBROUTINE TIME (STRING)
    CHARACTER (LEN=8) STRING
  END SUBROUTINE TIME
END INTERFACE
```

**STRING** Must be of type character and must provide at least 8 bytes of storage to contain the current time in the form: `hh:mm:ss` where *hh* is the current hour, *mm* the current minute, *ss* the number of seconds past the minute.

**Description**

This routine returns the system time in seconds since 00:00:00 GMT, January 1, 1970. It fills the `STRING` parameter with current time.

**Class**

Nonstandard subroutine.

**Output**

The elapsed time in seconds since 00:00:00 Greenwich Mean Time, January 1, 1970.

**Example**

The following code sets the character variable `tstr` to the current system time (for example, 16:20:07).

```
CHARACTER(8) tstr
CALL TIME(tstr)
```

---

## TIMEF

*Returns the elapsed time since last called*

---

**Prototype**

```
INTERFACE
  REAL(4) FUNCTION TIMEF( )
  END FUNCTION TIMEF
END INTERFACE
```

`TIME`                      elapsed time in seconds

## Description

This function returns the number of seconds that elapsed since the first time TIMEF was called, or zero if the called for the first time.

## Output

The number of seconds that elapsed since the first time TIMEF was called, or zero if called for the first time.

---

## TOPEN

*Tape open*

---

## Prototype

```
INTERFACE
    INTEGER(4) FUNCTION TOPEN(LUNIT, DEVNAME, &
                             LABELLED)
        INTEGER(4), INTENT(OUT)      :: LUNIT
        CHARACTER(LEN=*), INTENT(IN) :: DEVNAME
        LOGICAL(4), INTENT(IN)       :: LABELLED
    END FUNCTION TOPEN
END INTERFACE
```

TLU	A Fortran logical unit number of 0 to 99 range
DEVNAME	the device name of the tape unit
LABELLED	indicates whether the tape to be opened is a labelled tape: 1 for a labeled tape or zero for an unlabeled tape

## Description

TOPEN opens a Fortran logical unit on a tape device for use with TREAD and TWRITE.



---

**NOTE.** *This function is for Win32 systems only.*

---

## Output

0 for successful open or most recent value of `errno` for an error.

---

# TCLOSE

*Close a tape file*

---

## Prototype

```
INTERFACE
  INTEGER(4) FUNCTION TCLOSE( TLU)
    INTEGER(4), INTENT(IN):: TLU
  END FUNCTION TCLOSE
END INTERFACE
```

TLU                    a Win32 file handle descriptor

## Description

Using a file handle obtained from a previous call to TOPEN, TCLOSE closes a tape file on a tape drive on your local system.



---

**NOTE.** *This function is for Win32 systems only.*

---

## Output

TCLOSE returns zero if the close operation was successful, or returns `errno` if the close operation was not successful.

---

## TREAD

*Read from a tape file*

---

### Prototype

```
INTERFACE
  INTEGER(4) FUNCTION TREAD(TLU, BUFFER)
    INTEGER(4), INTENT(IN) :: TLU
    CHARACTER(LEN=*) , INTENT(OUT) :: BUFFER
  END FUNCTION TREAD
END INTERFACE
```

TLU is a file handle descriptor

BUFFER a character variable, array, or array section large enough to hold the next record on the tape

### Description

TREAD reads the next logical record from an already opened tape file. You must have previously opened the file using the TOPEN routine, and obtained a valid Win32 system file handle.




---

**NOTE.** *This function is for Win32 systems only.*

---



## Output

TREAD places the next logical record of a tape file in the input variable BUFFER. If the read operation is successful, TREAD returns zero as its result. If the read operation is not successful, TREAD returns `errno` as its result.

---

# TTYNAM

*Checks if the unit is a terminal*

---

## Prototype

```
INTERFACE
  CHARACTER (LEN=*) FUNCTION TTYNAM(LUN)
  INTEGER(4) INTENT(IN) :: LUN
  END FUNCTION TTYNAM
END INTERFACE
```

LUN                    a Fortran logical unit number

## Description

This function determines whether a particular logical unit is connected to a terminal (TTY) display device.

## Output

A string indicating the CHARACTER device name for a terminal device, or all blanks if not a terminal, or an error.

---

## TWRITE

*Writes to a tape file*

---

### Prototype

```
INTERFACE
  INTEGER FUNCTION TWRITE(TLU, BUFFER)
    INTEGER(4), INTENT(IN) :: TLU
    CHARACTER(LEN=*), INTENT(OUT) :: BUFFER
  END FUNCTION TREAD
END INTERFACE
```

TLU is a file handle descriptor

BUFFER a CHARACTER expression whose value is data to be written to a tape file on your local system

### Description

TWRITE takes the data you pass to it in the input expression BUFFER and writes it as a logical record to a tape device on your local system. You must have previously opened the tape device with a call to TOPEN, and obtained a valid Win32 system file handle.

### Output

TWRITE returns zero if the write operation was successful, and otherwise returns the system error code from errno.

---

## UNLINK

*Deletes a file by name*

---

### Prototype

```
INTERFACE
    INTEGER(4) FUNCTION UNLINK (NAME)
        CHARACTER(LEN=*) , INTENT(IN) :: NAME
    END FUNCTION UNLINK
END INTERFACE
```

NAME                      the name of the file you want to delete

### Description

UNLINK deletes a file with the name specified by NAME. You must have adequate permission to delete the file. The name can be any character expression that results in a valid file name. The name can include a full path name, including drive letter.

### Output

UNLINK returns a status code, which is zero if the deletion was successful, or the value of `errno` if the file deletion was not successful.

---

## UNPACKTIMEQQ

*Unpacks a packed time and date value.*

---

### Prototype

```
USE IFLPORT
OR
```

## IA-32 systems

```

INTERFACE
  SUBROUTINE UNPACKTIMEQQ (TIMEDATE, IYR, IMON, IDAY, &
                           IHR, IMIN, ISEC)

    INTEGER(4) TIMEDATE
    INTEGER(2) IYR, IMON, IDAY, IHR, IMIN, ISEC
  END SUBROUTINE
END INTERFACE

```

## Itanium™-based systems

```

INTERFACE
  SUBROUTINE UNPACKTIMEQQ (TIMEDATE, IYR, IMON, IDAY, &
                           IHR, IMIN, ISEC)

    INTEGER(8) TIMEDATE
    INTEGER(2) IYR, IMON, IDAY, IHR, IMIN, ISEC
  END SUBROUTINE
END INTERFACE

```

## Description

Unpacks a packed time and date value into its component parts. See `PACKTIMEQQ`.

## Usage

```

CALL UNPACKTIMEQQ (TIMEDATE, IYR, IMON, IDAY,
                  IHR, IMIN, ISEC)

```

<code>TIMEDATE</code>	<code>INTEGER(4)</code> . Packed time and date information.
<code>IYR</code>	<code>INTEGER(2)</code> . Year (xxxx AD).
<code>IMON</code>	<code>INTEGER(2)</code> . Month (1 - 12).
<code>IDAY</code>	<code>INTEGER(2)</code> . Day (1 - 31).
<code>IHR</code>	<code>INTEGER(2)</code> . Hour (0 - 23).
<code>IMIN</code>	<code>INTEGER(2)</code> . Minute (0 - 59).
<code>ISEC</code>	<code>INTEGER(2)</code> . Second (0 - 59).

GETFILEINFOQQ returns time and date in a packed format. You can use UNPACKTIMEQQ to unpack these values. Use PACKTIMEQQ to repack times for passing to SETFILETIMEQQ. Packed times can be compared using relational operators.

### Example

```
! Note, compile this example with /nbs.
USE IFPORT
CHARACTER(80)    file
TYPE (FILE$INFO) info
INTEGER(4) handle, result
INTEGER(2) iyr, imon, iday, ihr, imin, isec
file = 'd:\f90ps\bin\t???.*'
handle = FILE$FIRST
result = GETFILEINFOQQ(file, info, handle)
CALL UNPACKTIMEQQ(info%lastwrite, iyr, imon,&
                  iday, ihr, imin, isec)
WRITE(*,*) iyr, imon, iday
WRITE(*,*) ihr, imin, isec
END
```

## National Language Support Routines

National Language Support (NLS) procedures provide language localization and a subset of multi-byte character set (MBCS) NLS functions to let you write applications in different languages. To use an NLS routine, add the following statement to the program unit containing the procedure:

```
USE IFPORT
or
INCLUDE
"<installation directory>\perform\include\ifport.f90"
```

Table 2-1 summarizes the NLS procedures. The names are listed in mixed case to make the mnemonics easier to understand. When writing your applications, you can use any case.

**Table 2-1 Multi-byte Routines and Functions Summary**

Name/Syntax	Subroutine / Function	Description
<b>Locale Setting and Inquiry</b>		
<b>NLSEnumCodepages</b> ptr => NLSEnumCodepages ( )	Function	Returns all the supported codepages on the system.
<b>NLSEnumLocales</b> ptr => NLSEnumLocales ( )	Function	Returns all the languages and country combinations supported by the system.
<b>NLSGetEnvironmentCodepage</b> result = NLSGetEnvironmentCodepage ( flags )	Function	Returns the codepage number for the system (Window) codepage or the console codepage.
<b>NLSGetLocale</b> CALL NLSGetLocale ( [language] [, country] [, codepage ] )	Subroutine	Returns the current language, country, and codepage.
<b>NLSGetLocaleInfo</b> result = NLSGetLocaleInfo ( type, outstr )	Function	Returns requested information about the current local code set.
<b>NLSSetEnvironmentCodepage</b> result = NLSSetEnvironmentCodepage ( codepage, flags )	Function	Changes the codepage for the current console.
<b>NLSSetLocale</b> result = NLSSetLocale ( language [, country] [, codepage ] )	Function	Sets the language, country, and codepage.

continued

**Table 2-1 Multi-byte Routines and Functions Summary** (continued)

Name/Syntax	Subroutine / Function	Description
<b>Locale Formatting</b>		
<b>NLSFormatCurrency</b> <pre>result = NLSFormatCurrency ( outstr, instr [, flags ] )</pre>	Function	Formats a number string and returns the correct currency string for the current locale.
<b>NLSFormatDate</b> <pre>result = NLSFormatDate ( outstr [, intime ] [, flags ] )</pre>	Function	Returns a correctly formatted string containing the date for the current locale.
<b>NLSFormatNumber</b> <pre>result = NLSFormatNumber ( outstr, instr [, flags ] )</pre>	Function	Formats a number string and returns the correct number string for the current locale.
<b>NLSFormatTime</b> <pre>result = NLSFormatTime ( outstr [, intime ] [, flags ] )</pre>	Function	Returns a correctly formatted string containing the time for the current locale.
<b>MBCS Inquiry</b>		
<b>MBCharLen</b> <pre>result = MBCharLen (string)</pre>	Function	Returns the length, in bytes, of the first character in a multi-byte-character string.
<b>MBCurMax</b> <pre>result = MBCurMax ( )</pre>	Function	Returns the longest possible multi-byte character length, in bytes, for the current codepage.
<b>MBLead</b> <pre>result = MBLead ( char )</pre>	Function	Determines whether a given character is the lead (first) byte of a multi-byte character sequence.
<b>MBLen</b> <pre>result = MBLen ( string )</pre>	Function	Returns the number of characters in a multi-byte-character string, including trailing blanks.

continued

**Table 2-1 Multi-byte Routines and Functions Summary** (continued)

Name/Syntax	Subroutine / Function	Description
<b>MBLen_Trim</b> result = MBLen_Trim (string)	Function	Returns the number of characters in a multi-byte-character string, not including trailing blanks.
<b>MBNext</b> result = MBNext ( string, position )	Function	Returns the position of the first lead byte or single-byte character immediately following the given position in a multi-byte-character string.
<b>MBPrev</b> result = MBPrev ( string, position )	Function	Returns the position of the first lead byte or single-byte character immediately preceding the given string position in a multi-byte-character string.
<b>MBStrLead</b> result = MBStrLead (string, position)	Function	Performs a context-sensitive test to determine whether a given character byte in a string is a multi-byte-character lead byte.
<b>MBCS Conversion</b>		
<b>MBConvertMBToUnicode</b> result = MBConvertMBToUnicode (mbstr, unicodestr [, flags ] )	Function	Converts a character string from a multi-byte codepage to a Unicode string.
<b>MBConvertUnicodeToMB</b> result = MBConvertUnicodeToMB (unicodestr, mbstr [,flags])	Function	Converts a Unicode string to a multi-byte character string of the current codepage.

continued



**Table 2-1 Multi-byte Routines and Functions Summary (continued)**

Name/Syntax	Subroutine / Function	Description
<b>MBCS Fortran Equivalent Procedures</b>		
<b>MBINCHARQQ</b> <code>result = MBINCHARQQ (string)</code>	Function	Same as INCHARQQ except that it can read a single multi-byte character at once and returns the number of bytes read.
<b>MBINDEX</b> <code>result = MBINDEX ( string, substring [, back ] )</code>	Function	Same as INDEX, except that multi-byte characters can be included in its arguments.
<b>MBLGE, MBLGT, MBLLE, MBLLT, MBLEQ, MBLNE</b> <code>result = MBLGE ( string_a, string_b, [ flags ] )</code>	Function	Same as LGE, LGT, LLE, and LLT, and the logical operators .EQ. and .NE., except that multi-byte characters can be included in their arguments. All these routines have the same arguments as shown for MBLGE.
<b>MBSCAN</b> <code>result = MBSCAN ( string, set [, back ] )</code>	Function	Same as SCAN, except that multi-byte characters can be included in its arguments.
<b>MBVERIFY</b> <code>result = MBVERIFY ( string, set [, back ] )</code>	Function	Same as VERIFY, except that multi-byte characters can be included in its arguments.
<b>MBJISTTOJMS</b>	Function	Converts a Japan Industry Standard (JIS) character to a Microsoft Kanji (Shift JIS or JMS) character.
<b>MBJMSTTOJIS</b>	Function	Converts a Microsoft Kanji (Shift JIS or JMS) character to a Japan Industry Standard (JIS) character.

## Locale Setting and Inquiry Procedures

---

### NLSEnumCodepages

*Returns all the supported codepages on the system*

---

#### Prototype

```
INTERFACE
  FUNCTION NLSEnumCodepages ( )
    INTEGER(4), POINTER :: NLSEnumCodepages ( : )
  END FUNCTION
END INTERFACE
```

#### Description

Returns an array containing the code pages supported by the system, with each array element describing one valid codepage.




---

**NOTE.** *After use, the pointer returned by NLSEnumCodepages should be deallocated with the DEALLOCATE statement.*

---

#### Output

Pointer to an array of codepages, with each element describing one supported codepage.

---

## NLSEnumLocales

*Returns all the language and country combinations supported by the system*

---

### Prototype

```
INTERFACE
    FUNCTION NLSEnumLocales()
        INTEGER(4), PARAMETER :: NLS$MaxLanguageLen = 64
        INTEGER(4), PARAMETER :: NLS$MaxCountryLen = 64
        TYPE NLS$EnumLocale
            SEQUENCE
            CHARACTER(LEN= NLS$MaxLanguageLen) Language
            CHARACTER(LEN= NLS$MaxCountryLen) Country
            INTEGER(4) DefaultWindowsCodepage
            INTEGER(4) DefaultConsoleCodepage
        END TYPE
        TYPE(NLS$EnumLocale), POINTER::NLSEnumLocales (:)
    END FUNCTION
END INTERFACE
```

### Description

Returns an array containing the language and country combinations supported by the system, in which each array element describes one valid combination.



---

**NOTE.** *After use, the pointer returned by NLSEnumLocales should be deallocated with the DEALLOCATE statement.*

---

## Output

Pointer to an array of locales, in which each array element describes one supported language and country combination.

If the application is a Windows or a QuickWin application, NLS\$DefaultWindowsCodepage is the codepage used by default for the given language and country combination. If the application is a console application, NLS\$DefaultConsoleCodepage is the codepage used by default for the given language and country combination.

---

## NLSGetEnvironmentCodepage

*Returns the codepage number for the system or the console codepage*

---

### Prototype

```
INTERFACE
```

```
    INTEGER(4) FUNCTION
```

```
NLSGetEnvironmentCodepage( FLAGS )
```

```
    INTEGER(4), INTENT(IN) :: FLAGS
```

```
END FUNCTION
```

```
END INTERFACE
```

FLAGS                      Tells the function which codepage number to return.  
Available values are:

NLS\$ConsoleEnvironmentCodepage - gets the  
codepage for the console

NLS\$WindowsEnvironmentCodepage - gets the  
current Windows codepage

### Description

Returns the codepage number for the system (Window) codepage or the console codepage.

## Output

Zero if successful; otherwise, returns one of the following error codes:

`NLS$ErrorInvalidFlags`

indicates that `FLAGS` has an illegal value

`NLS$ErrorNoConsole`

there is no console associated with the given application;  
therefore, operations with the console codepage are not  
possible.

---

## NLSGetLocale

*Returns the current language, country,  
and/or codepage.*

---

## Prototype

INTERFACE

SUBROUTINE NLSGetLocale (LANGUAGE, COUNTRY, &  
CODEPAGE)

CHARACTER(LEN=\*) , INTENT(OUT) , OPTIONAL :: LANGUAGE

CHARACTER(LEN=\*) , INTENT(OUT) , OPTIONAL :: COUNTRY

INTEGER(4) , INTENT(OUT) , OPTIONAL :: CODEPAGE

END SUBROUTINE

END INTERFACE

LANGUAGE           Optional, output. Character(LEN=\*). Current language.

COUNTRY            Optional, output. Character(LEN=\*). Current country.

CODEPAGE           Optional, output. Character(LEN=\*). Current codepage.

## Description

Retrieves the current language, country, and/or codepage.




---

**NOTE.** `NLSGetLocale` returns a valid codepage in codepage. It does not return one of the `NLS$. . .` symbolic constants that can be used with `NLSSetLocale`.

---

## Output

Requested information about the current language, country, and codepage.

---

## NLSGetLocaleInfo

Returns information about the current local code set

---

### Prototype

```
INTERFACE
```

```
    INTEGER(4) FUNCTION NLSGetLocaleInfo(INFOTYPE, &
                                         OUTSTR)
```

```
        INTEGER(4), INTENT(IN) :: INFOTYPE
```

```
        CHARACTER(LEN=*) , INTENT(OUT) :: OUTSTR
```

```
    END FUNCTION
```

```
END INTERFACE
```

**INFOTYPE**      Input NLS parameter requested. A list of parameter names is given in the NLS Locale Info Parameters in "Note."

**OUTSTR**        Output. Character(LEN=\*). Parameter setting for the current locale. All parameter settings placed in OUTSTR are character strings, even numbers. If a parameter setting is numeric, the ASCII representation of the number is used. If

the requested parameter is a date or time string, an explanation of how to interpret the format in OUTSTR is given in NLS Date and Time Format.

Description

Returns requested information about the current local code set.



**NOTE.** *The NLS\$LI parameters are used for the argument INFOTYPE and select the locale information returned by NLSGetLocaleInfo in OUTSTR. You can perform an inclusive OR with NLS\$NoUserOverride and any NLS\$LI parameter. This causes NLSGetLocaleInfo to bypass any user overrides and always return the system default value.*

Table 2-2 lists and describes all NLS\$LI parameters.

Table 2-2 NLS\$LI Parameters

Name	Description
NLS\$LI_ILANGUAGE	An ID indicating the language
NLS\$LI_SLANGUAGE	The full localized name of the language.
NLS\$LI_SENGLANGUAGE	The full English name of the language from the ISO Standard 639. This is limited to characters that map into the ASCII 127 character subset.
NLS\$LI_SABBEVLANGNAME	The abbreviated name of the language, created by taking the 2-letter language abbreviation as found in ISO Standard 639 and adding a third letter as appropriate to indicate the sublanguage.
NLS\$LI_SNATIVELANGNAME	The native name of the language.

continued

**Table 2-2 NLS\$LI Parameters** (continued)

Name	Description
NLS\$LI_ICOUNTRY	The country code, based on international phone codes, also referred to as IBM country codes.
NLS\$LI_SCOUNTRY	The full localized name of the country.
NLS\$LI_SENGCOUNTRY	The full English name of the country. This will always be limited to characters that map into the ASCII 127 character subset.
NLS\$LI_SABBREVCTRYNAME	The abbreviated name of the country as per ISO Standard 3166.
NLS\$LI_SNATIVECTRYNAME	The native name of the country.
NLS\$LI_IDEFAULTLANGUAGE	Language ID for the principal language spoken in this locale. This is provided so that partially specified locales can be completed with default values.
NLS\$LI_IDEFAULTCOUNTRY	Country code for the principal country in this locale. This is provided so that partially specified locales can be completed with default values.
NLS\$LI_IDEFAULTANSICODEPAGE	ANSI code page associated with this locale.
NLS\$LI_IDEFAULTOEMCODEPAGE	OEM code page associated with the locale.
NLS\$LI_SLIST	Character(s) used to separate list items, for example, comma in many locales.
NLS\$LI_IMEASURE	This value is 0 if the metric system (S.I.) is used and 1 for the U.S. system of measurements.

continued



**Table 2-2      NLS\$LI Parameters** (continued)

Name	Description
NLS\$LI_SDECIMAL	The character(s) used as decimal separator. This cannot be set to digits 0 - 9.
NLS\$LI_STHOUSAND	The character(s) used as separator between groups of digits left of the decimal. This cannot be set to digits 0 - 9.
NLS\$LI_SGROUPING	Sizes for each group of digits to the left of the decimal. An explicit size is needed for each group; sizes are separated by semicolons. If the last value is 0 the preceding value is repeated. To group thousands, specify "3;0".
NLS\$LI_IDIGITS	The number of decimal digits.
NLS\$LI_IDIGITSNLS\$LI_ILZERO	Determines whether to use leading zeros in decimal fields: 0 - Use no leading zeros 1 - Use leading zeros.
NLS\$LI_INEGNUMBER	Determines how negative numbers are represented: 0 - Puts negative numbers in parentheses: (1.1) 1 - Puts a minus sign in front: -1.1 2 - Puts a minus sign followed by a space in front: - 1.1 3 - Puts a minus sign after: 1.1- 4 - Puts a space then a minus sign after: 1.1 -

continued

**Table 2-2 NLS\$LI Parameters** (continued)

Name	Description
NLS\$LI_SNATIVEDIGITS	The ten characters that are the native equivalent to the ASCII 0-9.
NLS\$LI_SCURRENCY	The string used as the local monetary symbol. Cannot be set to digits 0-9.
NLS\$LI_SINTLSYMBOL	Three characters of the International monetary symbol specified in ISO 4217 "Codes for the Representation of Currencies and Funds", followed by the character separating this string from the amount.
.	
NLS\$LI_SMONDECIMALSEP	The character(s) used as monetary decimal separator. This cannot be set to digits 0-9.
NLS\$LI_SMONTHOUSANDSEP	The character(s) used as monetary separator between groups of digits left of the decimal. Cannot be set to digits 0-9.
NLS\$LI_SMONGROUPING	Sizes for each group of monetary digits to the left of the decimal. If the last value is 0, the preceding value is repeated. To group thousands, specify "3;0".
NLS\$LI_ICURRDIGITS	Number of decimal digits for the local monetary format.
NLS\$LI_IINTLCURRDIGITS	Number of decimal digits for the international monetary format.

continued

Table 2-2      NLS\$LI Parameters (continued)

Name	Description
NLS\$LI_ICURRENCY	Determines how positive currency is represented: 0 - Puts currency symbol in front with no separation: \$1.1 1 - Puts currency symbol in back with no separation: 1.1\$ 2 - Puts currency symbol in front with single space after: \$ 1.1 3 - Puts currency symbol in back with single space before: 1.1 \$
NLS\$LI_INEGCURR	Determines how negative currency is represented: 0: (\$1.1) 1: -\$1.1 2: \$-1.1 3: \$1.1- 4: (1.1\$) 5: -1.1\$ 6: 1.1-\$ 7: 1.1\$- 8: -1.1 \$ (space before \$) 9: -\$ 1.1 (space after \$) 10: 1.1 \$- (space before \$) 11: \$ 1.1- (space after \$) 12: \$ -1.1 (space after \$) 13: 1.1- \$ (space before \$) 14: (\$ 1.1) (space after \$) 15: (1.1 \$) (space before \$)

continued

**Table 2-2 NLS\$LI Parameters** (continued)

Name	Description
NLS\$LI_SPOSITIVESIGN	String value for the positive sign. Cannot be set to digits 0-9.
NLS\$LI_SNEGATIVESIGN	String value for the negative sign. Cannot be set to digits 0-9.
NLS\$LI_IPOSSIGNPOSN	Determines the formatting index for positive values: 0 - Parenthesis surround the amount and the monetary symbol 1 - The sign string precedes the amount and the monetary symbol 2 - The sign string follows the amount and the monetary symbol 3 - The sign string immediately precedes the monetary symbol 4 - The sign string immediately follows the monetary symbol
NLS\$LI_INEGSIGNPOSN	Determines the formatting index for negative values. Same values as for NLS\$LI_IPOSSIGNPOSN
NLS\$LI_IPOSSYMPRECEDES	1 if the monetary symbol precedes, 0 if it follows a positive amount.
NLS\$LI_IPOSSEPBYSPACE	1 if the monetary symbol is separated by a space from a positive amount, 0 otherwise.
NLS\$LI_INEGSYMPRECEDES	1 if the monetary symbol precedes, 0 if it follows a negative amount
NLS\$LI_INEGSEPBYSPACE	1 if the monetary symbol is separated by a space from a negative amount, 0 otherwise.

continued

**Table 2-2 NLS\$LI Parameters** (continued)

Name	Description
NLS\$LI_STIMEFORMAT	Time formatting string. See the NLS Date and Time Format section for explanations of the valid strings.
NLS\$LI_STIME	Character(s) for the time separator. Cannot be set to digits 0-9.
NLS\$LI_ETIME	Time format: 0 - Use 12-hour format 1 - Use 24-hour format
NLS\$LI_ITLZERO	Determines whether to use leading zeros in time fields: 0 - Use no leading zeros 1 - Use leading zeros for hours
NLS\$LI_S1159	String for the AM designator
NLS\$LI_S2359	String for the PM designator.
NLS\$LI_SSHORTDATE	Short Date formatting string for this locale. The d, M and y should have the day, month, and year substituted, respectively. See the NLS Date and Time Format section for explanations of the valid strings.
NLS\$LI_SDATE	Character(s) for the date separator. Cannot be set to digits 0-9.
NLS\$LI_IDATE	Short Date format ordering: 0 - Month-Day-Year 1 - Day-Month-Year 2 - Year-Month-Day

continued

**Table 2-2 NLS\$LI Parameters** (continued)

Name	Description
NLS\$LI_ICENTURY	Specifies whether to use full 4-digit century for the short date only: 0 - Two-digit year 1 - Full century
NLS\$LI_IDAYLZERO	Specifies whether to use leading zeros in day fields for the short date only: 0 - Use no leading zeros 1 - Use leading zeros
NLS\$LI_IMONLZERO	Specifies whether to use leading zeros in month fields for the short date only: 0 - Use no leading zeros 1 - Use leading zeros
NLS\$LI_SLONGDATE	Long Date formatting string for this locale. The string returned may contain a string within single quotes ( ' ). Any characters within single quotes should be left as is. The d, M and y should have the day, month, and year substituted, respectively.
NLS\$LI_ILDATE	Long Date format ordering: 0 - Month-Day-Year 1 - Day-Month-Year 2 - Year-Month-Day
NLS\$LI_ICALENDARTYPE	Specifies which type of calendar is currently being used: 1 - Gregorian (as in United States) 2 - Gregorian (English strings always) 3 - Era: Year of the Emperor (Japan) 4 - Era: Year of the Republic of China 5 - Tangun Era (Korea)

continued

**Table 2-2 NLS\$LI Parameters** (continued)

Name	Description
NLS\$LI_IOPTIONALCALENDAR	Specifies which additional calendar types are valid and available for this locale. This can be a null separated list of all valid optional calendars: 0 - No additional types valid 1 - Gregorian (localized) 2 - Gregorian (English strings always) 3 - Era: Year of the Emperor (Japan) 4 - Era: Year of the Republic of China 5 - Tangun Era (Korea)
NLS\$LI_IFIRSTDAYOFWEEK	Specifies which day is considered first in a week: 0 - SDAYNAME1 1 - SDAYNAME2 2 - SDAYNAME3 3 - SDAYNAME4 4 - SDAYNAME5 5 - SDAYNAME6 6 - SDAYNAME7
NLS\$LI_IFIRSTWEEKOFYEAR	Specifies which week of the year is considered first: 0 - Week containing 1/1 1 - First full week following 1/1 2 - First week containing at least 4 days
NLS\$LI_SDAYNAME1	Long name for Monday
NLS\$LI_SDAYNAME2	Long name for Tuesday
NLS\$LI_SDAYNAME3	Long name for Wednesday
NLS\$LI_SDAYNAME4	Long name for Thursday
NLS\$LI_SDAYNAME5	Long name for Friday
NLS\$LI_SDAYNAME6	Long name for Saturday
NLS\$LI_SDAYNAME7	Long name for Sunday
NLS\$LI_SABBREVDAYNAME1	Abbreviated name for Monday
NLS\$LI_SABBREVDAYNAME2	Abbreviated name for Tuesday
NLS\$LI_SABBREVDAYNAME3	Abbreviated name for Wednesday

continued

**Table 2-2 NLS\$LI Parameters** (continued)

Name	Description
NLS\$LI_SABBREVDAYNAME4	Abbreviated name for Thursday
NLS\$LI_SABBREVDAYNAME5	Abbreviated name for Friday
NLS\$LI_SABBREVDAYNAME6	Abbreviated name for Saturday
NLS\$LI_SABBREVDAYNAME7	Abbreviated name for Sunday
NLS\$LI_SMONTHNAME1	Long name for January
NLS\$LI_SMONTHNAME2	Long name for February
NLS\$LI_SMONTHNAME3	Long name for March
NLS\$LI_SMONTHNAME4	Long name for April
NLS\$LI_SMONTHNAME5	Long name for May
NLS\$LI_SMONTHNAME6	Long name for June
NLS\$LI_SMONTHNAME7	Long name for July
NLS\$LI_SMONTHNAME8	Long name for August
NLS\$LI_SMONTHNAME9	Long name for September
NLS\$LI_SMONTHNAME10	Long name for October
NLS\$LI_SMONTHNAME11	Long name for November
NLS\$LI_SMONTHNAME12	Long name for December
NLS\$LI_SMONTHNAME13	Long name for 13th month (if exists)
NLS\$LI_SABBREVMONTHNAME1	Abbreviated name for January
NLS\$LI_SABBREVMONTHNAME2	Abbreviated name for February
NLS\$LI_SABBREVMONTHNAME3	Abbreviated name for March
NLS\$LI_SABBREVMONTHNAME4	Abbreviated name for April
NLS\$LI_SABBREVMONTHNAME5	Abbreviated name for May
NLS\$LI_SABBREVMONTHNAME6	Abbreviated name for June
NLS\$LI_SABBREVMONTHNAME7	Abbreviated name for July
NLS\$LI_SABBREVMONTHNAME8	Abbreviated name for August
NLS\$LI_SABBREVMONTHNAME9	Abbreviated name for September
NLS\$LI_SABBREVMONTHNAME10	Abbreviated name for October
NLS\$LI_SABBREVMONTHNAME11	Abbreviated name for November

continued



**Table 2-2**      **NLS\$LI Parameters** (continued)

Name	Description
NLS\$LI_SABBREVMONTHNAME12	Abbreviated name for December
NLS\$LI_SABBREVMONTHNAME13	Abbreviated name for 13th month (if exists)

### Output

Returns the number of characters written to OUTSTR if successful. If OUTSTR has 0 length, the number of characters required to hold the requested information is returned. Otherwise, one of the following error codes returns:

NLS\$ErrorInvalidLIType

The given INFOTYPE is invalid.

NLS\$ErrorInsufficientBuffer

The OUTSTR buffer was too small, but was not 0 (so that the needed size would be returned).

---

## NLSSetEnvironmentCodepage

*Changes the codepage for the current console*

---

### Prototype

```
INTERFACE
    INTEGER(4) FUNCTION
        NLSSetEnvironmentCodepage(CODEPAGE, FLAGS)
    INTEGER(4), INTENT(IN) :: CODEPAGE
    INTEGER(4), INTENT(IN) :: FLAGS
    END FUNCTION
END INTERFACE
```

## Description

Sets the codepage for the current console. The specified codepage affects the current console program and any other programs launched from the same console. It does not affect other open consoles or any consoles opened later.




---

**NOTE.** *The `FLAGS` argument must be `NLS$ConsoleEnvironmentCodepage`; it cannot be `NLS$WindowsEnvironmentCodepage`. `NLS$SetEnvironmentCodepage` does not affect the Windows codepage*

---

## Output

Returns zero if successful. Otherwise, returns one of the following error codes:

- `NLS$ErrorInvalidCodepage`  
CODEPAGE is invalid or not installed on the system
- `NLS$ErrorInvalidFlags`  
FLAGS is not valid.
- `NLS$ErrorNoConsole`  
There is no console associated with the given application; therefore operations, with the console codepage are not possible.

---

## NLSSetLocale

*Sets the language, country, and  
codepage*

---

### Prototype

```
INTERFACE
    INTEGER(4) FUNCTION NLSSetLocale(LANGUAGE,COUNTRY,&
    CODEPAGE)
        CHARACTER(LEN=*) , INTENT(IN) :: LANGUAGE
        CHARACTER(LEN=*) , INTENT(IN) , OPTIONAL :: COUNTRY
        INTEGER(4) , INTENT(IN) , OPTIONAL :: CODEPAGE
    END FUNCTION
END INTERFACE
```

LANGUAGE	Input. CHARACTER(LEN=*). One of the languages supported by the Win32* NLS APIs.
COUNTRY	Optional, input. CHARACTER(LEN=*). If specified, characterizes the language further. If omitted, the default country for the language is set.
CODEPAGE	Optional, input. INTEGER(4). If specified, codepage to use for all character-oriented NLS functions. Can be any valid supported codepage or one of the following predefined values: <div style="margin-left: 20px;"> <p>NLS\$CurrentCodepage The codepage is not changed. Only the language and country settings are altered by the function.</p> <p>NLS\$ConsoleEnvironmentCodepage The codepage is changed to the default environment codepage currently in effect for console programs.</p> </div>

## NLS\$ConsoleLanguageCodepage

The codepage is changed to the default console codepage for the language and country combination specified.

## NLS\$WindowsEnvironmentCodepage

The codepage is changed to the default environment codepage currently in effect for Windows programs.

## NLS\$WindowsLanguageCodepage

The codepage is changed to the default Windows codepage for the language and country combination specified.

If you omit CODEPAGE, it defaults to NLS\$WindowsLanguageCodepage. At program startup, NLS\$WindowsEnvironmentCodepage is used to set the codepage.

## Description

Sets the current language, country, and/or codepage.




---

**NOTE.** *NLS\$SetLocale works on installed locales only. Windows NT and Windows 95 support many locales, but these must be installed through the system Windows NT Control Panel/International menu or the Windows 95 Control Panel/Regional Settings menu.*

---

In addition to the note above take into consideration the following:

- When doing mixed-language programming with Fortran and C, calling NLS\$SetLocale with a codepage other than the default environment Windows codepage causes the codepage in the C run-time library to change by calling C language setmbcp( ) routine with the new codepage. Conversely, changing the C run-time library codepage does not change the codepage in the Fortran NLS library
- Calling NLS\$SetLocale has no effect on the locale used by C programs. The locale set with C language setlocale( ) routine is independent of NLS\$SetLocale.

- Calling `NLS$SetLocale` with the default environment console codepage, `NLS$ConsoleEnvironmentCodepage`, causes an implicit call to the Win32 API `SetFileApisToOEM( )`. Calling `NLS$SetLocale` with any other codepage causes a call to `SetFileApisToANSI( )`.

### Output

Zero if successful. Otherwise, one of the following error codes may be returned:

`NLS$ErrorInvalidLanguage`

LANGUAGE is invalid or not supported.

`NLS$ErrorInvalidCountry`

COUNTRY is invalid or is not valid with the language specified.

`NLS$ErrorInvalidCodepage`

CODEPAGE is invalid or not installed on the system.

## Locale Formatting Procedures

---

### NLSFormatCurrency

*Returns a correctly formatted  
currency string for the current locale*

---

#### Prototype

INTERFACE

INTEGER(4) FUNCTION NLSFormatCurrency(OUTSTR, &  
INSTR, FLAGS)

INTEGER(4), INTENT(IN), OPTIONAL :: FLAGS

CHARACTER(LEN=\*), INTENT(IN) :: INSTR

CHARACTER(LEN=\*), INTENT(OUT) :: OUTSTR

```

        END FUNCTION
END INTERFACE

OUTSTR      Output. CHARACTER(LEN=*). String containing the
              correctly formatted currency for the current locale. If
              OUTSTR is longer than the formatted currency, it is
              blank-padded.

INSTR       Input. CHARACTER(LEN=*). Number string to be
              formatted. Can contain only the characters 0' through
              9', one decimal point (a period) if a floating-point
              value, and a minus sign in the first position if
              negative. All other characters are invalid and cause
              the function to return an error.

FLAGS       Optional, input. INTEGER(4). If specified, modifies
              the currency conversion. If you omit FLAGS s, the
              flag NLS$Normal is used. Available values are:

              NLS$Normal
                  No special formatting

              NLS$NoUserOverride
                  Do not use user overrides

```

## Description

Formats a number string and returns the correct currency string for the current locale.

## Output

Number of characters written to OUTSTR (bytes are counted, not multibyte characters), or one of the following negative values if an error occurs:

```

NLS$ErrorInsufficientBuffer
    OUTSTR buffer is too small

NLS$ErrorInvalidInput
    FLAGS has an illegal value

NLS$ErrorInvalidFlags
    INSTR has an illegal value.

```

---

## NLSFormatDate

*Returns a correctly formatted string containing the date for the current locale*

---

### Prototype

```
INTERFACE
    INTEGER(4) FUNCTION NLSFormatDate(OUTSTR, INTIME, &
                                      FLAGS)
    INTEGER(4), INTENT(IN), OPTIONAL :: FLAGS, INTIME
    CHARACTER(LEN=*) , INTENT(OUT) :: OUTSTR
END FUNCTION
END INTERFACE
```

OUTSTR	Output. CHARACTER(LEN=*) . String containing the correctly formatted date for the current locale. If OUTSTR is longer than the formatted date, it is blank-padded.
INTIME	Optional, input. INTEGER(4) . If specified, date to be formatted for the current locale. Must be an integer date such as the packed time created with PACKTIMEQQ. If you omit INTIME, the current system date is formatted and returned in OUTSTR.
FLAGS	Optional, input. INTEGER(4) . If specified, modifies the date conversion. If you omit FLAGS, the flag NLS\$Normal is used. Available values are: NLS\$Normal    No special formatting NLS\$NoUserOverride    Do not use user overrides NLS\$UseAltCalendar    Use the locale's alternate calendar

NLS\$LongDate

Use local long date format

NLS\$ShortDate

Use local short date format

## Description

Returns a correctly formatted string containing the date for the current locale.

## Output

Number of characters written to OUTSTR (bytes are counted, not multibyte characters), or one of the following negative values if an error occurs:

NLS\$ErrorInsufficientBuffer

OUTSTR buffer is too small

NLS\$ErrorInvalidInput

INTIME has an illegal value

## NLS\$ErrorInvalidFlags

FLAGS has an illegal value

## NLSFormatNumber

*Returns a correctly formatted number string for the current locale*

## Prototype

## INTERFACE

```
INTEGER(4) FUNCTION NLSFormatNumber(OUTSTR, INSTR,&
                                     FLAGS)
```

```
INTEGER(4), INTENT(IN), OPTIONAL :: FLAGS
```

```
CHARACTER ( LEN=* ),  INTENT ( IN )  :: INSTR
```



```

CHARACTER(LEN=*) , INTENT(OUT) :: OUTSTR
END FUNCTION
END INTERFACE
OUTSTR      Output. CHARACTER(LEN=*) . String containing the
              correctly formatted number for the current locale. If
              OUTSTR is longer than the formatted number, it is
              blank-padded.

INSTR      Input. CHARACTER(LEN=*) . Number string to be
              formatted. Can only contain the characters 0' through
              9', one decimal point (a period) if a floating-point
              value, and a minus sign in the first position if
              negative. All other characters are invalid and cause
              the function to return an error.

FLAGS      Optional, input. INTEGER(4) . If specified, modifies
              the number conversion. If you omit FLAGS, the flag
              NLS$Normal is used. Available values are:
              NLS$Normal
                  No special formatting
              NLS$NoUserOverride
                  Do not use user overrides

```

## Description

Formats a number string and returns the correct number string for the current locale.

## Output

Number of characters written to OUTSTR (bytes are counted, not multibyte characters), or one of the following negative values if an error occurs:

```

NLS$ErrorInsufficientBuffer
    OUTSTR buffer is too small

NLS$ErrorInvalidInput
    INSTR has an illegal value

```

NLS\$ErrorInvalidFlags  
 FLAGS has an illegal value

---

## NLSFormatTime

*Returns a correctly formatted string  
 containing the time for the current  
 locale*

---

### Prototype

```
INTERFACE
  INTEGER(4) FUNCTION NLSFormatTime(OUTSTR, INTIME, &
                                     FLAGS)

  INTEGER(4), INTENT(IN), OPTIONAL :: FLAGS, INTIME
  CHARACTER(LEN=*) , INTENT(OUT) :: OUTSTR
END FUNCTION
END INTERFACE
```

OUTSTR	Output. CHARACTER(LEN=*). String containing the correctly formatted time for the current locale. If OUTSTR is longer than the formatted time, it is blank-padded.
INTIME	Optional, input. INTEGER(4). If specified, time to be formatted for the current locale. Must be an integer time such as the packed time created with PACKTIMEQQ. If you omit INTIME, the current system time is formatted and returned in OUTSTR.
FLAGS	Optional, input. INTEGER(4). If specified, modifies the time conversion. If you omit FLAGS, the flag NLS\$Normal is used. Available values are: NLS\$Normal                No special formatting NLS\$NoUserOverride      Do not use user overrides

`NLS$NoMinutesOrSeconds`  
     Do not return minutes or seconds  
`NLS$NoSeconds`   Do not return seconds  
`NLS$NoTimeMarker`  
     Do not add a time marker string  
`NLS$Force24HourFormat`  
     Return string in 24 hour format

### Description

Returns a correctly formatted string containing the time for the current locale.

### Output

Number of characters written to OUTSTR (bytes are counted, not multibyte characters), or one of the following negative values if an error occurs:

`NLS$ErrorInsufficientBuffer`  
     OUTSTR buffer is too small  
`NLS$ErrorInvalidInput`  
     INTIME has an illegal value  
`NLS$ErrorInvalidFlags`  
     FLAGS has an illegal value

## MBCS Inquiry Procedures

---

### MBCharLen

*Returns the length, in bytes, of the first character in a multibyte-character string*

---

#### Prototype

```
INTERFACE
  INTEGER(4) FUNCTION MBCharLen(STRING)
    CHARACTER(LEN=*) , INTENT(IN) :: STRING
  END FUNCTION
END INTERFACE
```

STRING      Input. CHARACTER(LEN=\*). String containing the character whose length is to be determined. Can contain multibyte characters.

#### Description

Returns the length, in bytes, of the first character in a multibyte-character string.




---

**NOTE.** MBCharLen *does not test for multibyte character validity*.

---

#### Output

Number of bytes in the first character contained in *string*. Returns 0 if STRING has no characters (is length 0).

---

## MBCurMax

*Returns the longest possible multibyte character length, in bytes, for the current codepage*

---

### Prototype

```
INTERFACE
  INTEGER(4) FUNCTION MBCurMax( )
  END FUNCTION
END INTERFACE
```

### Description

Returns the longest possible multibyte character length, in bytes, for the current codepage.



---

**NOTE.** *The MBLenMax parameter, defined in the module IFLPORT.F90, is the longest length, in bytes, of any character in any codepage installed on the system.*

---

### Output

Longest possible multibyte character, in bytes, for the current codepage.

---

## MBLen

*Returns the number of characters in a multibyte-character string, including trailing blanks*

---

### Prototype

INTERFACE

INTEGER(4) FUNCTION MBLen (STRING)

CHARACTER (LEN=\*) , INTENT (IN) :: STRING

END FUNCTION

END INTERFACE

STRING                    Input. CHARACTER (LEN=\*) . String whose characters are to be counted. Can contain multibyte characters.

### Description

Returns the number of characters in a multibyte-character string, including trailing blanks.



---

**NOTE.** *MBLen recognizes multibyte-character sequences according to the multibyte codepage currently in use. It does not test for multibyte-character validity*

---

### Output

Number of characters in STRING.

---

## MBLen\_Trim

*Returns the number of characters in a multibyte-character string, not including trailing blanks*

---

### Prototype

INTERFACE

    INTEGER(4) FUNCTION MBLen\_Trim(STRING)

    CHARACTER(LEN=\*) , INTENT(IN) :: STRING

    END FUNCTION

END INTERFACE

STRING           Input. CHARACTER(LEN=\*). String whose characters are to be counted. Can contain multibyte characters.

### Description

Returns the number of characters in a multibyte-character string, not including trailing blanks.



---

**NOTE.** *MBLen\_Trim recognizes multibyte-character sequences according to the multibyte codepage currently in use. It does not test for multibyte-character validity.*

---

### Output

Number of characters in STRING minus any trailing blanks (blanks are bytes containing character 32 (hex 20) in the ASCII collating sequence).

## MBNext

*Returns the position of the first lead byte or single-byte character immediately following the given position in a multibyte-character string*

---

### Prototype

```
INTERFACE
  INTEGER(4) FUNCTION MBNext (STRING, POSITION)
    CHARACTER(LEN=*) , INTENT(IN) :: STRING
    INTEGER(4) , INTENT(IN) :: POSITION
  END FUNCTION
END INTERFACE
```

STRING	Input. CHARACTER(LEN=*) . String to be searched for the first lead byte or single-byte character after the current position. Can contain multibyte characters.
POSITION	Input. INTEGER(4) . Position in STRING to search from. Must be the position of a lead byte or a single-byte character. Cannot be the position of a trail (second) byte of a multibyte character.

### Description

Returns the position of the first lead byte or single-byte character immediately following the given position in a multibyte-character string.

### Output

Position of the first lead byte or single-byte character in STRING immediately following the position given in POSITION, or 0 if no following first byte is found in STRING.



---

## MBPrev

*Returns the position of the first lead byte or single-byte character immediately preceding the given string position in a multibyte-character string*

---

### Prototype

INTERFACE

    INTEGER(4) FUNCTION MBPrev(STRING, POSITION)

    CHARACTER(LEN=\*) , INTENT(IN) :: STRING

    INTEGER(4) , INTENT(IN) :: POSITION

    END FUNCTION

END INTERFACE

STRING	Input. CHARACTER(LEN=*) . String to be searched for the first lead byte or single-byte character before the current position. Can contain multibyte characters.
POSITION	Input. INTEGER(4) . Position in STRING to search from. Must be the position of a lead byte or single-byte character. Cannot be the position of the trail (second) byte of a multibyte character.

### Description

Returns the position of the first lead byte or single-byte character immediately preceding the given string position in a multibyte-character string.

### Output

Position of the first lead byte or single-byte character in STRING immediately preceding the position given in POSITION, or 0 if no preceding first byte is found in STRING.

## MBStrLead

*Performs a context-sensitive test to determine whether a given character byte in a string is a multibyte-character lead byte*

---

### Prototype

```
INTERFACE
  LOGICAL(4) FUNCTION MBStrLead(STRING, POSITION)
    CHARACTER(LEN=*) , INTENT(IN) :: STRING
    INTEGER(4) , INTENT(IN) :: POSITION
  END FUNCTION
END INTERFACE
```

**STRING**      Input. CHARACTER(LEN=\*). String containing the character byte to be tested for lead status.

**POSITION**      Input. INTEGER(4). Position in STRING of the character byte in the string to be tested.

### Description

Performs a context-sensitive test to determine whether a given character byte in a string is a multibyte-character lead byte.




---

**NOTE.** MBStrLead is passed a whole string and can identify any byte within the string as a lead or trail byte because it performs a context-sensitive test, scanning all the way back to the beginning of a string if necessary to establish context. MBLead is passed only one character at a time and must start on a lead byte and step through a string one character at a time to establish context for the character. Thus, MBStrLead can be much slower than MBLead (up to *n* times slower, where *n* is the length of the string).

---

## Output

Returns `.TRUE.` if the character byte in `POSITION` of `STRING` is a lead byte; otherwise, `.FALSE.`

# MBCS Conversion Procedures

---

## MBConvertMBToUnicode

*Converts a character string from a multi-byte codepage to a Unicode string*

---

### Prototype

```
INTERFACE
  INTEGER(4) FUNCTION MBConvertMBToUnicode(MBSTR,&
                                           UNICODESTR, FLAGS)

  CHARACTER(LEN=*) , INTENT(IN) :: MBSTR
  INTEGER(2) , DIMENSION(:) , INTENT(OUT) :: UNICODESTR
  INTEGER(4) , INTENT(IN) , OPTIONAL :: FLAGS
END FUNCTION
END INTERFACE
```

MBSTR	Input. CHARACTER(LEN=*). Multibyte codepage string to be converted.
UNICODESTR	Output. INTEGER(2). Array of integers that is the translation of the input string into Unicode.
FLAGS	Optional, input. INTEGER(4). If specified, modifies the string conversion. If FLAGS is omitted, the value <code>NLS\$Precomposed</code> is used. Available values are: <div style="margin-left: 40px;"><code>NLS\$Precomposed</code>  Use precomposed characters always.  (default)</div>

NLS\$Composite

Use composite wide characters always.

NLS\$UseGlyphChars

Use glyph characters instead of control characters.

NLS\$ErrorOnInvalidChars

Returns - 1 if an invalid input character is encountered.

The flags NLS\$Precomposed and NLS\$Composite are mutually exclusive. You can combine NLS\$UseGlyphChars with either NLS\$Precomposed or NLS\$Composite using an inclusive OR (IOR or OR).

## Description

Converts a multibyte-character string from the current codepage to a Unicode string.




---

**NOTE.** *By default, or if `FLAGS` is set to **NLS\$Precomposed**, the function **MBConvertMBToUnicode** attempts to translate the multibyte codepage string to a precomposed Unicode string. If a precomposed form does not exist, the function attempts to translate the codepage string to a composite form.*

---

## Output

If no error occurs, returns the number of bytes written to UNICODSTR (bytes are counted, not characters), or the number of bytes required to hold the output string if UNICODSTR has zero size. If the UNICODSTR array is bigger than needed to hold the translation, the extra elements are set to 0. If UNICODSTR has zero size, the function returns the number of bytes required to hold the translation and nothing is written to UNICODSTR.

If an error occurs, one of the following negative values is returned:

`NLS$ErrorInsufficientBuffer`

The `UNICODESTR` argument is too small, but not zero size so that the needed number of bytes would be returned.

`NLS$ErrorInvalidFlags`

The `FLAGS` argument has an illegal value.

`NLS$ErrorInvalidCharacter`

A character with no Unicode translation was encountered in `MBSTR`. This error can occur only if the `NLS$InvalidCharsError` flag was used in `FLAGS`.

---

## MBConvertUnicodeToMB

*Converts a Unicode string to a multi-byte character string of the current codepage*

---

### Prototype

INTERFACE

INTEGER(4) FUNCTION

MBConvertUnicodeToMB(UNICODESTR, MBSTR, FLAGS)

INTEGER(2), DIMENSION(:), INTENT(IN)::UNICODESTR

CHARACTER(LEN=\*), INTENT(OUT)::MBSTR

INTEGER(4), OPTIONAL, INTENT(IN)::FLAGS

END FUNCTION

END INTERFACE

`UNICODESTR`     Input. `INTEGER(2)`. Array of integers holding the Unicode string to be translated.

MBSTR	Output. CHARACTER ( LEN=* ). Translation of Unicode string into multibyte character string from the current codepage.
FLAGS	Optional, input. INTEGER ( 4 ). If specified, argument to modify the string conversion. If FLAGS is omitted, no extra checking of the conversion takes place. Available values are: <ul style="list-style-type: none"> <li>NLS\$CompositeCheck      Convert composite characters to precomposed.</li> <li>NLS\$SepChars      Generate separate characters.</li> <li>NLS\$DiscardDns      Discard nonspacing characters.</li> <li>NLS\$DefaultChars      Replace exceptions with default character.</li> </ul>

The last three flags (NLS\$SepChars, NLS\$DiscardDns, and NLS\$DefaultChars) are mutually exclusive and can be used only if NLS\$CompositeCheck is set, in which case one (and only one) of them is combined with NLS\$CompositeCheck using an inclusive OR (IOR or OR). These flags determine what translation to make when there is no precomposed mapping for a base character/nonspace character combination in the Unicode wide character string. The default (IOR(NLS\$CompositeCheck, NLS\$SepChars)) is to generate separate characters.

## Output

If no error occurs, returns the number of bytes written to MBSTR (bytes are counted, not characters), or the number of bytes required to hold the output string if MBSTR has zero length. If MBSTR is longer than the translation, it is blank-padded. If MBSTR is zero length, the function returns the number of bytes required to hold the translation and nothing is written to MBSTR.

If an error occurs, one of the following negative values is returned:

`NLS$ErrorInsufficientBuffer`

The `MBSTR` argument is too small, but not zero length  
so that the needed number of bytes is returned.

`NLS$ErrorInvalidFlags`

The `FLAGS` argument has an illegal value.

## MBCS Fortran Equivalent Procedures

---

### MBINCHARQQ

*Same as `INCHARQQ` except that it can  
read a single multi-byte character at once  
and returns the number of bytes read*

---

#### Prototype

INTERFACE

    INTEGER(4) FUNCTION MBInCharQQ (STRING)

    CHARACTER (LEN=2), INTENT (OUT) :: STRING

        ! LEN=MBLENMAX

    END FUNCTION

END INTERFACE

STRING

Output. `CHARACTER (MBLenMax)`. String containing  
the read characters, padded with blanks up to the  
length `MBLenMax`. The `MBLenMax` parameter, defined  
in the module `iflport.F90`, is the longest length, in  
bytes, of any character in any codepage installed on  
the system.

## Description

Performs the same function as `INCHARQQ` except that it can read a single multibyte character at once, and it returns the number of bytes read as well as the character.

## Output

Number of characters read.

---

## MBINDEX

*Same as INDEX, except that multibyte characters can be included in its arguments*

---

## Prototype

```
INTERFACE
```

```
    INTEGER(4) FUNCTION MBIndex(STRING, SUBSTRING, &  
                                BACK)
```

```
    CHARACTER(LEN=*) , INTENT(IN) :: STRING, SUBSTRING
```

```
    LOGICAL(4) , INTENT(IN) , OPTIONAL :: BACK
```

```
END FUNCTION
```

```
END INTERFACE
```

**STRING**      Input. `CHARACTER(LEN=*)`. String to be searched for the presence of `SUBSTRING`. Can contain multibyte characters.

**SUBSTRING**    Input. `CHARACTER(LEN=*)`. Substring whose position within `STRING` is to be determined. Can contain multibyte characters.

**BACK**          Optional, input. `LOGICAL(4)`. If specified, determines direction of the search. If `BACK` is `.FALSE.` or is omitted, the search starts at the



beginning of `STRING` and moves toward the end. If `BACK` is `.TRUE.`, the search starts end of `STRING` and moves toward the beginning.

### Description

Performs the same function as `INDEX` except that the strings manipulated can contain multibyte characters.

### Output

If `BACK` is omitted or is `.FALSE.`, returns the leftmost position in `STRING` that contains the start of `SUBSTRING`. If `BACK` is `.TRUE.`, returns the rightmost position in `STRING` which contains the start of `SUBSTRING`. If `STRING` does not contain `SUBSTRING`, returns 0. If `SUBSTRING` occurs more than once, returns the starting position of the first occurrence ("first" is determined by the presence and value of `BACK`).

---

## MBLGE, MBLGT, MBLLE, MBLLT, MBLEQ, MBLNE

*Same as `LGE`, `LGT`, `LLE`, and `LLT`,  
and the logical operators `.EQ.` and  
`.NE`*

---

### Prototype

INTERFACE

LOGICAL(4) FUNCTION MBLGE(STRA, STRB, FLAGS)

CHARACTER(LEN=\*), INTENT(IN) :: STRA, STRB

INTEGER(4), INTENT(IN), OPTIONAL :: FLAGS

END FUNCTION

END INTERFACE

STRA, STRB     Input. CHARACTER(LEN=\*). Strings to be compared.  
Can contain multibyte characters.

## FLAGS

Optional, input. `INTEGER( 4 )`. If specified, determines which character traits to use or ignore when comparing strings. You can combine several flags using an inclusive OR (`IOR` or `OR`). There are no illegal combinations of flags, and the functions may be used without flags, in which case all flag options are turned off. The available values are:

`NLS$MB_IgnoreCase`

Ignore case.

`NLS$MB_IgnoreNonspace`

Ignore nonspacing characters (this flag removes Japanese accent characters if they exist).

`NLS$MB_IgnoreSymbols`

Ignore symbols.

`NLS$MB_IgnoreKanaType`

Do not differentiate between Japanese Hiragana and Katakana characters (corresponding Hiragana and Katakana characters will compare as equal).

`NLS$MB_IgnoreWidth`

Do not differentiate between a single-byte character and the same character as a double byte.

`NLS$MB_StringSort`

Sort all symbols at the beginning, including the apostrophe and hyphen (See **NOTE** that follows).

## Description

Perform the same functions as LGE, LGT, LLE, LLT and the logical operators .EQ. and .NE. except that the strings being compared can include multi-byte characters, and optional flags can modify the comparison. All these routines have the same arguments as shown for MBLGE above.



---

**NOTE.** *If the strings supplied contain Arabic Kashidas, the Kashidas are ignored during the comparison. Therefore, if the two strings are identical except for Kashidas within the strings, the functions return a value indicating they are "equal" in the collation sense, though not necessarily identical.*

---



---

**NOTE.** *When not using the NLS\$MB\_StringSort flag, the hyphen and apostrophe are special symbols and are treated differently than others. This is to ensure that words like coop and co-op stay together within a list. All symbols, except the hyphen and apostrophe, sort before any other alphanumeric character. If you specify the NLS\$MB\_StringSort flag, hyphen and apostrophe sort at the beginning also.*

---

## Output

Comparisons are made using the current locale, not the current codepage. The codepage used is the default for the language/country combination of the current locale.

The outputs of these functions are as follows:

- MBLGE returns .TRUE. if the strings are equal or STRA comes last in the collating sequence. Otherwise, it returns .FALSE..
- MBLGT returns .TRUE. if STRA comes last in the collating sequence. Otherwise, it returns .FALSE..

- MBLLE returns `.TRUE.` if the strings are equal or STRA comes first in the collating sequence. Otherwise, it returns `.FALSE.`
- MBLLT returns `.TRUE.` if STRA comes first in the collating sequence. Otherwise, it returns `.FALSE.`
- MBLEQ returns `.TRUE.` if the strings are equal in the collating sequence. Otherwise, it returns `.FALSE.`
- MBLNE returns `.TRUE.` if the strings are not equal in the collating sequence. Otherwise, it returns `.FALSE.`
- If the two strings are of different lengths, they are compared up to the length of the shortest one. If they are equal to that point, then the return value indicates that the longer string is greater.
- If `FLAGS` is invalid, the functions return `.FALSE.`

---

## MBSCAN

*Same as SCAN, except that multi-byte characters can be included in its arguments*

---

### Prototype

```
INTERFACE
```

```
  INTEGER(4) FUNCTION MBScan(STRING, SET, BACK)
```

```
    CHARACTER(LEN=*) , INTENT(IN) :: STRING, SET
```

```
    LOGICAL(4) , INTENT(IN) , OPTIONAL :: BACK
```

```
  END FUNCTION
```

```
END INTERFACE
```

**STRING**            Input. `CHARACTER(LEN=*)`. String to be searched for the presence of any character in `SET`.

**SET**                Input. `CHARACTER(LEN=*)`. Characters to search for.

**BACK**              Optional, input. `LOGICAL(4)`. If specified, determines direction of the search. If `BACK` is `.FALSE.` or is omitted, the search starts at the

beginning of STRING and moves toward the end. If BACK is .TRUE., the search starts end of STRING and moves toward the beginning.

### Description

Performs the same function as SCAN except that the strings manipulated can contain multibyte characters.

### Output

If BACK is .FALSE. or is omitted, returns the position of the leftmost character in STRING that is in SET. If BACK is .TRUE., returns the rightmost character in STRING that is in SET. If no characters in STRING are in SET, returns 0.

---

## MBVERIFY

*Same as VERIFY, except that multibyte characters can be included in its arguments*

---

### Prototype

INTERFACE

INTEGER(4) FUNCTION MBVerify(STRING, SET, BACK)

CHARACTER(LEN=\*), INTENT(IN)::STRING, SET

LOGICAL(4), INTENT(IN), OPTIONAL::BACK

END FUNCTION

END INTERFACE

STRING           Input. CHARACTER(LEN=\*). String to be searched for presence of any character not in SET.

SET               Input. CHARACTER(LEN=\*). Set of characters tested to verify that it includes all the characters in string.

**BACK**                      Optional, input. LOGICAL ( 4 ). If specified, determines direction of the search. If BACK is .FALSE. or is omitted, the search starts at the beginning of STRING and moves toward the end. If BACK is .TRUE. , the search starts end of STRING and moves toward the beginning.

## Description

Performs the same function as VERIFY except that the strings manipulated can contain multibyte characters.

## Output

If BACK is .FALSE. or is omitted, returns the position of the leftmost character in STRING that is not in SET. If BACK is .TRUE. , returns the rightmost character in STRING that is not in SET. If all the characters in STRING are in SET, returns 0.

---

## MBJISTToJMS

*Converts a Japan Industry Standard (JIS) character to a Microsoft Kanji (Shift JIS or JMS) character*

---

## Prototype

```
INTERFACE
    CHARACTER (LEN=2) FUNCTION MBJISToJMS (CHAR)
    CHARACTER (LEN=2) , INTENT(IN) :: CHAR
    END FUNCTION
END INTERFACE

CHAR                      Input. CHARACTER ( LEN=2 ). JIS character to be
                           converted.
```

## Description

Converts a Japan Industry Standard (JIS) character to a Microsoft Kanji (Shift JIS or JMS) character.

A JIS character is converted only if the lead and trail bytes are in the hexadecimal range 21 through 7E.



---

**NOTE.** *Only computers with Japanese installed as one of the available languages can use the MBJISToJMS conversion function.*

---

## Output

MBJISToJMS returns a Microsoft Kanji (Shift JIS or JMS) character.

---

## MBJMSTToJIS

*Converts a Microsoft Kanji (Shift JIS or JMS) character to a Japan Industry Standard (JIS) character*

---

## Prototype

INTERFACE

    CHARACTER(LEN=2) FUNCTION MBJMSToJIS( CHAR )

    CHARACTER(LEN=2), INTENT(IN) :: CHAR

    END FUNCTION

END INTERFACE

CHAR                   Input. CHARACTER(LEN=2). JMS character to be converted.

## Description

Converts a Microsoft Kanji (Shift JIS or JMS) character to a Japan Industry Standard (JIS) character.

A JMS character is converted only if the lead byte is in the hexadecimal range 81 through 9F or E0 through FC, and the trail byte is in the hexadecimal range 40 through 7E or 80 through FC.



---

**NOTE.** *Only computers with Japanese installed as one of the available languages can use the `MBJMSTOJIS` conversion function.*

---

## Output

`MBJMSTOJIS` returns a Japan Industry Standard (JIS) character.



# *POSIX Functions*

---

# 3

This chapter describes the functions that comprise the POSIX library (`libPOSF90.lib`). These functions are made available to the compiler when you invoke the `/4Yposixlib` option for Win32\* systems, and `-posixlib` option for Linux systems. These functions implement the IEEE POSIX FORTRAN-77 Language bindings, as specified in IEEE Standard 1003.9-1992. The POSIX standard is ISO/IEC 9945-1:1990. Copies of the standard are available from IEEE.

The prototypes are described using the `INTERFACE` call, which provides the required information to complete a call to the specified procedure. For descriptions of the `INTERFACE` block and the `/4Yposixlib` option for Win32 systems, and `-posixlib` option for Linux systems, see the *Intel® Fortran Compiler User's Guide*.

## **POSIX Library Interface**

Depending on whether you are using free- or fixed-form source, you can interface to POSIX library in the following ways:

- With free-form source, to interface to `libPOSF90.lib` (POSIX library), your code should contain the

```
INCLUDE 'iflposix.f90'
```

statement where `iflposix.f90` is the interface file.

- For fixed-form source, the `iflposix.f90` file has to be edited and compiled with the `/4L132` option for Win32 systems, or `-132` for Linux systems. Or you can create a module like this:

```
MODULE iflposix
  INCLUDE 'iflposix.f90'
END MODULE
```

In addition, in your fixed-form source include `USE iflposix` statement.

---

## PXFACCESS

*Determines the accessibility of the file*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFACCESS (PATH, ILEN, IAMODE,
    IERROR)
  CHARACTER (LEN=*) PATH
  INTEGER(4) ILEN, IAMODE, IERROR
END SUBROUTINE PXFACCESS
```

END INTERFACE

PATH	name of the file
ILEN	length of PATH string
IAMODE	one or more of the following:
	for Win32 systems:
	0 -- checks for existence of the file
	2 -- checks for write access
	4 -- checks for read access
	6 -- checks for read/write access
	for Linux systems:
	0-- checks for existence of the file
	1 -- checks for execute permission
	2 -- checks for write access

4 -- checks for read access  
 IERROR return value

### Description

Checks for the accessibility of a file or directory. On Win32 systems, if the name given is a directory name, then the function only checks for existence. All directories have read/write access on Win32 systems.

### Output

If successful, IERROR is set to zero. If the file does not exist, or the appropriate access is not available, IERROR is set to -1.

If the file does not exist, or the appropriate access is not available, an error code is returned in IERROR. Possible error codes include:

-1 a bad parameter was passed  
 EACCES access requested was denied  
 ENOENT file did not exist

See your Microsoft Visual C++ installation in the include directory under errno.h for the values of EACCES and ENOENT.

---

## PXFAINTGET

*Gets an integer array component of a structure*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFAINTGET (JHANDLE, COMPNAME, VALUE,
    IALEN, IERROR)
  INTEGER(4) JHANDLE, IALEN, IERROR
  CHARACTER(LEN=*) COMPNAME
```

```

      INTEGER(4) VALUE(IALEN)
      END SUBROUTINE PXFAINTGET
END INTERFACE

JHANDLE      handle to the structure
COMPNAME     component name
VALUE        (out) store the value of the component here
IALEN        length of the VALUE array
IERROR       return value

```

**Description**

This subroutine gets an integer array component of a structure.

**Output**

If successful, IERROR is set to zero. ENONAME is set when no such component name exist for the structure. EARRAYLEN contains the number of array elements that exceeds IALEN.

---

## PXFAINTSET

*Sets an integer array component of a structure*

---

**Prototype**

```

INTERFACE
  SUBROUTINE PXFAINSET(JHANDLE, COMPNAME, VALUE,
    IALEN, IERROR)
    INTEGER(4) JHANDLE, IALEN, IERROR
    CHARACTER(LEN=*) COMPNAME
    INTEGER(4) VALUE(IALEN)
  END SUBROUTINE PXFAINTSET
END INTERFACE

```

JHANDLE	handle to structure
COMPNAME	component name
VALUE	values to set
IALEN	length of the VALUE array
IERROR	return value

### Description

This subroutine sets an integer array component of a structure.

## Output

If successful, `IERROR` is set to zero. Otherwise, `ENONAME` is set when no such component name is found in the structure. `EARRAYLEN` is set to the number of array elements that exceeds `IALEN`.

## PXFCALLSUBHANDLE

*Calls the associated subroutine*

## Prototype

```

INTERFACE
  SUBROUTINE PXFCALLSUBHANDLE(JHANDLE2, IVAL,
    IERROR)
    INTEGER(4) JHANDLE2, IVAL, IERROR
  END SUBROUTINE PXFCALLSUBHANDLE
END INTERFACE

```

JHANDLE2	handle to subroutine
IVAL	argument to subroutine
IERROR	(out) error status

**Description**

This subroutine, given a subroutine handle, calls the associated subroutine.



---

**NOTE.** *The subroutine shall not be a function, an intrinsic, or an entry point and shall be defined with exactly ONE integer argument.*

---

**Output**

If successful, IERROR is set to zero.

---

## PXFCHDIR

*Changes the current working directory*

---

**Prototype**

```
INTERFACE
  SUBROUTINE CHDIR(PATH, ILEN, IERROR)
    CHARACTER(LEN=*) PATH
    INTEGER(4) ILEN, IERROR
  END SUBROUTINE CHDIR
END INTERFACE
```

PATH	the directory to be changed to
ILEN	length of the PATH string
IERROR	return value

**Description**

This subroutine changes the current working directory.

**Output**

If successful, IERROR is set to zero.

---

## PXFCHMOD

*Changes the ownership mode of the file.*

---

### Prototype

INTERFACE

```
SUBROUTINE PXFCHMOD (PATH, ILEN, IMODE, IERROR)
  CHARACTER (LEN=*) PATH
  INTEGER(4) ILEN, IMODE, IERROR
END SUBROUTINE PXFCHMOD
```

END INTERFACE

PATH	name of the file
ILEN	length of the PATH string
IMODE	mode; on Win32 systems, see your Microsoft Visual C++ Installation in the \include directory under sys\stat.h for the values of IMODE. On Linux systems, use octal file-access code.
IERROR	return value

### Description

This subroutine changes the ownership mode of a file.




---

**NOTE.** *On Linux systems, you must have sufficient ownership permissions, such as being the owner of the file or having read/write access of the file*

---

### Output

If successful, IERROR is set to zero.

---

## PXFCHOWN

*Changes the owner and group of a file*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFCHOWN(PATH, ILEN, IOWNER, IGROUP,
    IERROR)
    CHARACTER(LEN=*) PATH
    INTEGER(4) ILEN, IOWNER, IGROUP, IERROR
  END SUBROUTINE PXFCHOWN
END INTERFACE
```

PATH	file or directory name
ILEN	length of the PATH string
IOWNER	owner uid
IGROUP	group gid
IERROR	(out) error status

### Description

This subroutine changes the owner and group of a file.

### Output

If successful, IERROR is set to zero for Linux systems; for Win32 a non-zero value is returned..



---

## PXFCLOSE

*Closes the file associated with descriptor*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFCLOSE (FD, IERROR)
    INTEGER(4) FD, IERROR
  END SUBROUTINE PXFCLOSE
END INTERFACE
```

FD                    file descriptor to be deleted  
IERROR                (output) returned error code

### Description

This subroutine closes the file associated with descriptor.

### Output

If successful, IERROR is set to zero.

---

## PXFCLOSEDIR

*Closes the directory stream*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFCLOSEDIR (IDIRID, IERROR)
    INTEGER(4) IDIRID, IERROR
  END SUBROUTINE PXFCLOSEDIR
END INTERFACE
```

IDIRID                pointer to DIR structure

IERROR                    (out) error status

### Description

This subroutine closes the directory stream and frees the DIR structure.

### Output

If successful, IERROR is set to zero.

---

## PXFCONST

*Retrieves the value associated with a constant*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFCONST (CONSTNAME, IVAL, IERROR)
    CHARACTER(LEN=*) CONSTNAME
    INTEGER(4) IVAL, IERROR
  END SUBROUTINE PXFCONST
END INTERFACE
```

CONSTNAME            name of the constant  
IVAL                    (out) value of the constant  
IERROR                (out) return value

### Description

This subroutine retrieves the value associated with a constant name. you can inquire about the values of the following symbolic constants:

```
STDIN_UNIT
STDOUT_UNIT
STDERR_UNIT
EINVAL
ENONAME
```

ENOHANDLE  
EARRAYLEN

The constants beginning with E signify various error values for the system variable `errno`. Check your MSVC++ documentation for more information, on Win32 systems. On Linux, look at the `/usr/include/errno.h` file.

## Output

If successful, `IERROR` is set to zero; otherwise, it is set to `-1`.

---

# PXFCREAT

*Creates a new file or rewrites an existing one*

---

## Prototype

```
INTERFACE
  SUBROUTINE PXFCREAT (PATH, ILEN, IMODE, IFILDES,
                      IERROR)
    CHARACTER(LEN=*) PATH
    INTEGER(4) ILEN, IMODE, IFILDES, IERROR
  END SUBROUTINE PFXCREAT
END INTERFACE
```

PATH	pathname of the file
ILEN	length of PATH string
IMODE	mode of the newly created file; on Win32 systems see your Microsoft Visual C++ Installation in the <code>\include</code> directory under <code>sys\stat.h</code> for the values of IMODE. On Linux systems, use octal file-access code.
IFILDES	(output) file descriptor
IERROR	return value

**Description**

This subroutine creates a new file or rewrites an existing one.

**Output**

If successful, IERROR is set to zero.

---

**PXFDUP**

*Duplicates an existing file descriptor*

---

**Prototype**

```
INTERFACE
```

```
  SUBROUTINE PXFDUP (IFILDES, IFID, IERROR)
```

```
    INTEGER(4) IFILDES, IFID, IERROR
```

```
  END SUBROUTINE PXFDUP
```

```
END INTERFACE
```

IFILDES            descriptor to be duplicated

IFID              (output) handle for the duplicated descriptor

IERROR            (output) returned error code

**Description**

This subroutine duplicates an existing file descriptor.

**Output**

If successful, IERROR is set to zero.

---

## PXFDUP2

*Duplicates an existing file descriptor*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFDUP2 (IFILDES, IFILDES2, IERROR)
    INTEGER(4) IFILDES, IFILDES2, IERROR
  END SUBROUTINE PXFDUP2
END INTERFACE
```

IFILDES	descriptor to be duplicated
IFILDES2	desired handle for the duplicated descriptor
IERROR	(output) returned error code

### Description

This subroutine duplicates an existing file descriptor.

### Output

If successful, IERROR is set to zero.

---

## PXFEINTGET

*Gets a single element from an integer array component of a structure*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFEINTGET (JHANDLE, COMPNAME, INDEX,
    VALUE, IERROR)
    CHARACTER(LEN=*) COMPNAME
    INTEGER(4) JHANDLE, INDEX, VALUE, IERROR
  END SUBROUTINE PXFEINTGET
END INTERFACE
```

JHANDLE	handle to structure
COMPNAME	component name
INDEX	index of element
VALUE	(out) where the value of the component is stored
IERROR	return value

### Description

This subroutine gets a single element from an integer array component of a structure.

### Output

If successful, IERROR is set to zero. Otherwise, ENONAME is set when EINVAL is set if an invalid index is specified.

---

## PXFEINTSET

*Sets a single element from an integer array component of a structure*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFEINTSET (JHANDLE, COMPNAME,
    IVALUE, INDEX, IERROR)
    CHARACTER (LEN=*) COMPNAME
    INTEGER(4) JHANDLE, IVALUE, INDEX, IERROR
  END SUBROUTINE PXFEINTSET
END INTERFACE
```

JHANDLE	handle to structure
COMPNAME	component name
IVALUE	index of element
INDEX	value to set
IERROR	return value

### Description

This subroutine sets a single element from an integer array component of a structure.

### Output

If successful, IERROR is set to zero. Otherwise, ENONAME is set when no such component name exist for the structure. EINVAL is set when an invalid index is specified.

---

## PXFESTRGET

*Gets a single element from a string  
array component of a structure*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFESTRGET (JHANDLE, COMPNAME, INDEX,
    VALUE, ILEN, IERROR)
    INTEGER(4) JHANDLE, INDEX, ILEN, IERROR
    CHARACTER(LEN=*) COMPNAME, VALUE
  END SUBROUTINE PXFESTRGET
END INTERFACE
```

JHANDLE	handle to structure
COMPNAME	component name
INDEX	index of element
VALUE	(out) where the string is stored
ILEN	(out) length of string
IERROR	return value

### Description

This subroutine gets a single element from a string array component of a structure.

### Output

If successful, `IERROR` is set to zero. Otherwise, `ENONAME` is set when no such component name exist for the structure. `EINVAL` is set when an invalid index is specified.



---

## PXFEXECV

*Executes an executable*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFEXECV (PATH, LENPATH, ARGV,
    LENARGV, IARGC, IERROR)
    INTEGER(4) LENPATH, LENGARV(0:IARGC-1), IARGC,
      IERROR
    CHARACTER(LEN=*) PATH, ARGV(0:IARGC-1)
  END SUBROUTINE PXFEXECV
END INTERFACE
```

PATH	(input) new executable path
LENPATH	(input) length of PATH string
ARGV	(input) command-line arguments
LENARGV	(input) length of each argument string
IARGC	(input) argument count
IERROR	(output) error value

### Description

This subroutine executes an executable file. If successful, these functions do not return to the calling process.

### Output

Zero if successful, otherwise, an error code, the value of `ierrno`.

---

## PXFEXECVE

*Executes an executable with  
environment settings*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFEXECVE (PATH, LENPATH, ARGV,
    LENARGV, IARGC, ENV, LENENV, IENVC, IERROR)
    INTEGER(4) LENPATH, LENARGV(0:IARGC-1), IARGC,
      LENENV(IENVC), IENVC, IERROR
    CHARACTER(LEN=*) PATH, ARGV(0:IARGC-1), ENV(IENVC)
  END SUBROUTINE PXFEXECVE
END INTERFACE
```

PATH	(input) new executable path
LENPATH	(input) length of PATH string
ARGV	(input) command-line arguments
LENARGV	(input) length of each argument string
IARGC	(input) argument count
ENV	(input) environment setting
LENENV	(input) length of elements in ENV
IENVC	(input) number of element sin ENV
IERROR	return value

### Description

This subroutine executes an executable file with environment settings.

### Output

None.

---

## PXFEXECVP

*Executes a file*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFEXECVP (FILE, LENFILE, ARGV,
    LENARGV, IARGC, IERROR)
    INTEGER(4) LENFILE, LENARGV(0:IARGC-1), IARGC,
      IERROR
    CHARACTER(LEN=*) FILE, ARGV(0:IARGC-1)
  END SUBROUTINE PXFEXECVP
END INTERFACE
```

FILE	(input) file to be executed
LENFILE	(input) length of FILE
ARGV	(input) command-line arguments
LENARGV	(input) length of each argument string
IARGC	(input) argument count
IERROR	(output) error value

### Description

Executes a file.

### Output

None.

---

## PXFEXIT

*Exits from a process*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFEXIT ( ISTATUS )
    INTEGER(4) ISTATUS
  END SUBROUTINE PXFEXIT
END INTERFACE
```

ISTATUS            (input) exit value

### Description

This subroutine exits a process.

### Output

None.

---

## PXFFASTEXIT

*Exits from the process*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFFASTEXIT ( ISTATUS )
    INTEGER(4) ISTATUS
  END SUBROUTINE PXFFASTEXIT
END INTERFACE
```

ISTATUS            (input) exit value

### Description

This subroutine exits from the process. There is no possible return from this subroutine.

### Output

None.

---

## PXFFLUSH

*Writes any unwritten data for an output stream*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFFLUSH (LUNIT, IERROR)
    INTEGER(4) IUNIT, IERROR
  END SUBROUTINE PXFFLUSH
END INTERFACE
```

LUNIT	Input: a FORTRAN logical unit, which must be an INTEGER*4 expression with the value in the range of 0 to 100.
IERROR	Output: return value

### Description

This subroutine writes any unwritten data for an output stream.

### Output

If successful, IERROR is set to zero. For Linux, IERROR is always set to -1 for compatibility only as this subroutine is not used.

---

## PXFFGETC

*Reads a character from the specified stream (logical unit)*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFFGETC (LUNIT, CHAR, IERROR)
    CHARACTER(LEN=1) CHAR
    INTEGER(4) IERROR
  END SUBROUTINE PXFFGETC
END INTERFACE
```

LUNIT	a FORTRAN logical unit, which must be an INTEGER*4 expression with the value in the range of 0 to 100
CHAR	character to be read
IERROR	return value

### Description

This subroutine reads a character from the specified stream (logical unit).

### Output

If successful, IERROR is set to zero.

---

## PXFFILENO

*Returns the file descriptor associated with a stream*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFFILENO (LUNIT, FD, IERROR)
    INTEGER(4) LUNIT, FD, IERROR
  END SUBROUTINE PXFFILENO
END INTERFACE
```

LUNIT	a FORTRAN logical unit, which must be an INTEGER*4 expression with the value in the range of 0 to 100
FD	(output) file descriptor
IERROR	(output) returned error code

### Description

This subroutine returns the file descriptor associated with a stream.

### Output

If successful, IERROR is set to zero. Otherwise, EINVAL is set if LUNIT is not an open unit. EBADF is set if LUNIT is not connected with a file descriptor.

---

## PXFFORK

*Fork a child process*

---

### Prototype for Win32

```
INTERFACE
  SUBROUTINE PXFFORK (IPID, IERROR)
    INTEGER(4) IPID, IERROR
  END SUBROUTINE PXFFORK
END INTERFACE
```

### Prototype for Linux

```
INTERFACE PXFFORK
  SUBROUTINE LINUX_PXFFORK (IPID, IERROR)
    INTEGER(4) IPID, IERROR
  END SUBROUTINE LINUX_PXFFORK
  SUBROUTINE PXFFORK(IPID, PATHNAME, ARGS, IERROR)
    INTEGER(KIND=4), INTENT(OUT):: IPID
    CHARACTER(LEN=*), INTENT(IN) :: PATHNAME
    CHARACTER(LEN=*) ARGS(:)
    INTEGER(KIND=4), INTENT(OUT):: IERROR
  END SUBROUTINE
END INTERFACE
```

IPID	(output) process ID
PATHNAME	(input) path to executable file. Variable is used only for Win32 systems.
ARGS	(input) arguments for executable file. Variable is used only for Win32 systems.
IERROR	(output) zero if the process is started successfully. Otherwise contains an appropriate error value of IERRNO.



**Description**

This subroutine spawns an asynchronous child process. Interface that includes arguments `PATHNAME` and `ARGS` is used only in Win32 systems.

**Output**

A process handle or process ID is returned in the variable `IPID` if the process was successfully forked. Otherwise, the returned `IPID` value is -1.

---

**PXFFPUTC**

*Outputs a character to the specified stream (logical unit)*

---

**Prototype**

```
INTERFACE
```

```
  SUBROUTINE PXFFPUTC (LUNIT, CHAR, IERROR)
```

```
  CHARACTER (LEN=1) CHAR
```

```
  INTEGER(4) LUNIT, IERROR
```

```
  END SUBROUTINE PXFFPUTC
```

```
END INTERFACE
```

<code>LUNIT</code>	a FORTRAN logical unit, which must be an INTEGER*4 expression with the value in the range of 0 to 100
<code>CHAR</code>	character to be written
<code>IERROR</code>	return value

**Description**

This subroutine outputs a character to the specified stream.

**Output**

If successful, `IERROR` is set to zero. `EEND` is set if end of file is reached.

---

## PXFFSEEK

*Sets the position of the next input /  
output on the stream*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFFSEEK (LUNIT, IOFFSET, IWHENCE,
    IERROR)
    INTEGER(4) LUNIT, IOFFSET, IWHENCE, IERROR
  END SUBROUTINE PXFFSEEK
END INTERFACE
```

LUNIT	a Fortran logical unit, which must be an <code>INTEGER*4</code> expression with the value in the range of 0 to 100.
IOFFSET	number of bytes away from whence to place the pointer
IWHENCE	determines the position within the stream as one of the following constants, which are defined in <code>STDIO.H</code> for Win32 or Linux systems:  <code>SEEK_SET =0</code> offset from beginning of file <code>SEEK_CUR =1</code> offset from current position of file pointer <code>SEEK_END =2</code> offset from end of file
IERROR	return value

### Description

This subroutine sets the position of the next input/output on the stream.

## Output

If successful, `IERROR` is set to 0. `EINVAL` is set if no file connected to `LUNIT` if `IWHENCE` is not a proper value or resulting offset would be invalid. `ESPIPE` is set if `LUNIT` is a pipe or FIFO. `EEND` is set if end of file is reached.

---

# PXFFSTAT

*Gets a file status*

---

## Prototype

```
INTERFACE
  SUBROUTINE PXFFSTAT (IFILDES, JSTAT, IERROR)
    INTEGER(4) IFILDES, JSTAT, IERROR
  END SUBROUTINE PXFFSTAT
END INTERFACE
```

<code>IFILDES</code>	file handle
<code>JSTAT</code>	pointer to the <code>PXFFSTAT</code> structure
<code>IERROR</code>	return value

## Description

This subroutine gets the status of a file.

## Output

If successful, `IERROR` is set to zero.

---

## PXFFTELL

*Returns the relative position in bytes  
from the beginning of the file*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFFTELL (LUNIT, IOFFSET, IERROR)
    INTEGER(4) LUNIT, IOFFSET, IERROR
  END SUBROUTINE PXFFTELL
END INTERFACE
```

LUNIT	a Fortran logical unit, which must be an <code>INTEGER*4</code> expression with the value in the range of 0 to 100
IOFFSET	(output) relative position in bytes from beginning of the file
IERROR	return value

### Description

This subroutine is used for Win32 only. It returns the relative position in bytes from the beginning of the file.

### Output

If successful, `IERROR` is set to zero.

---

## PXFGETARG

*Get the specified command-line argument*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFGETARG (ARGNUM, STR, ISTR, IERROR,&
                        LEN)
    CHARACTER (LEN=*) STR
    INTEGER(4) ARGNUM, ISTR, IERROR, LEN
  END SUBROUTINE PXFGETARG
END INTERFACE
```

ARGNUM            (input) number of command-line argument

STR                (input/output) place for required argument

ISTR              (input) length of place for required argument

IERROR            (output) error value

LEN                (output) length of argument string

### Description

This subroutine return command-line argument.

### Output

If successful, IERROR is set to zero, STR is set to command-line argument  
LEN is set to length of returned command-line argument.

---

## PXFGETC

*Reads a character from standard input,  
unit 5*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFGETC (NEXTCHAR, IERROR)
    CHARACTER (LEN=1) NEXTCHAR
    INTEGER(4) IERROR
  END SUBROUTINE PXFGETC
END INTERFACE
```

NEXTCHAR	character to be read
IERROR	return value

### Description

This subroutine reads a character from the standard input, unit 5.

### Output

If successful, IERROR is set to zero.

---

## PXFGETCWD

*Retrieves the path of the current working directory*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFGETCWD (BUF, ILEN, IERROR)
    CHARACTER (LEN=*) BUF
    INTEGER(4) ILEN, IERROR
  END SUBROUTINE PXFGETCWD
END INTERFACE
```

BUF	(output) storage for the retrieved pathname
ILEN	(output) length of the retrieved pathname
IERROR	return value

### Description

This subroutine retrieves the path of the current working directory.

### Output

If successful, IERROR is set to zero. EINVAL is set if the size of BUF is insufficient.

---

## PXFGETGRGID

*Gets entry with specified GID*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFGETGRGID (JGID, JGROUP, IERROR)
    INTEGER(4) IGID, JGROUP, IERROR
  END SUBROUTINE PXFGETGRGID
END INTERFACE
```

JGID	group ID
JGROUP	(output) pointer to the structure PXFGROUP
IERROR	(output) error status

### Description

This subroutine gets entry with specified group ID.

### Output

If successful, IERROR is not changed.

---

## PXFGETGRNAM

*Get entry with the specified group name*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFGETGRNAM (NAME, ILEN, JGROUP,
    IERROR)
    CHARACTER(LEN=*) NAME
    INTEGER(4) ILEN, JGROUP, IERROR
  END SUBROUTINE PXFGETGRNAM
END INTERFACE
```



NAME	name of group
ILEN	length of NAME string
JGROUP	(output) pointer to the structure PXFGROUP
IERROR	(output) error status

### Description

This subroutine gets entry with the specified group name.

## Output

If successful, IERROR is not changed.

# PXFGETPWNAM

*Gets entry with specified user name*

## Prototype

```

INTERFACE
  SUBROUTINE PXFGETPWNAM (NAME, ILEN, JPASSWD,
    IERROR)
  CHARACTER (LEN=*) NAME
  INTEGER(4) JPASSWD, ILEN, IERROR
  END SUBROUTINE
END INTERFACE

```

NAME	login name of the user
ILEN	length of the NAME string
JPASSWD	(output) pointer to the structure PXFPASSWD
IERROR	(output) error status

**Description**

This subroutine gets entry with specified user name. For example, a login name might be “jsmith” while the actual name is “John Smith.”

**Output**

If successful, IERROR is not changed.

---

**PXFGETPWUID**

*Gets entry with specified UID*

---

**Prototype**

```
INTERFACE
  SUBROUTINE PXFGETPWUID (IUID, JPASSWD, IERROR)
    INTEGER(4) IUID, JPASSWD, IERROR
  END SUBROUTINE PXFGETPWUID
END INTERFACE
```

IUID	user ID
JPASSWD	(output) pointer to the structure PXFPASSWD
IERROR	(output) error status

**Description**

This subroutine gets entry with specified user ID.

**Output**

If successful, IERROR is set to zero.

---

## PXFGETSUBHANDLE

*Returns a subroutine handle for a specified subroutine*

---

### Prototype

```
INTERFACE
    SUBROUTINE PXFGETSUBHANDLE (SUB, JAHNDLE1,
                                IERROR)

    INTEGER(4) JHANDLE1, IERROR
    EXTERNAL SUB
    END SUBROUTINE PXFGETSUBHANDLE
END INTERFACE
```

SUB                    pointer to a subroutine  
 JAHNDLE1            (output) handle to subroutine  
 IERROR              (output) error status

### Description

This subroutine returns a subroutine handle for a specified subroutine.




---

**NOTE.** *The argument SUB shall not be a function, an intrinsic, or an entry point, and shall be defined with exactly one integer argument.*

---

### Output

If successful, IERROR is set to zero.

---

## PXFINTGET

*Gets an integer component of a structure*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFINTGET (JHANDLE, COMPNAME,
    VALUE, IERROR)
    INTEGER(4) JHANDLE, VALUE, IERROR
    CHARACTER(LEN=*) COMPNAME
  END SUBROUTINE PXFINTGET
END INTERFACE
```

JHANDLE	handle to the structure
COMPNAME	component name
VALUE	(output) where the value of the component is stored
IERROR	return value

### Description

This subroutine gets an integer component of a structure.

### Output

If successful, IERROR is set to zero. ENONAME is set if no such component name for the structure.

---

## PXFINTSET

*Sets an integer component of a structure*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFINTSET (JHANDLE, COMPNAME,
    VALUE, IERROR)
    INTEGER(4) JHANDLE, IERROR, VALUE
    CHARACTER(LEN=*) COMPNAME
  END SUBROUTINE
END INTERFACE
```

JHANDLE	handle to the structure
COMPNAME	component name
VALUE	set to this value
IERROR	return value

### Description

This subroutine sets an integer component of a structure.

### Output

If successful, IERROR is set to zero. ENONAME is set if no such component name for the structure.

---

## PXFISBLK

*Tests for block special file*

---

### Prototype

```
INTERFACE
  LOGICAL(4) FUNCTION PXFISBLK (M)
    INTEGER(4) M
  END FUNCTION PXFISBLK
END INTERFACE
```

M                    value of the ST\_MODE component in the structure  
                      PXFSTAT (stat)

### Description

This function tests for block special file.

### Output

A logical value is returned showing whether the specified file handle corresponds to a block device: `.TRUE.` if the file is a block mode file, `.FALSE.` otherwise.

**NOTE:** In Win32 systems, this function always returns `-1` (function not used).

---

## PXFISCHR

*Checks if character file*

---

### Prototype

INTERFACE

LOGICAL(4) FUNCTION PXFISCHR (M)

INTEGER(4) m

END FUNCTION PXFISCHR

END INTERFACE

M                    value of the ST\_MODE component in the structure  
                       PXFSTAT (stat)

### Description

This function checks if the file is character file.

### Output

A logical value is returned, showing whether the specified file handle corresponds to a character mode device: `.TRUE.` if the logical unit M is connected to a character mode device, `.FALSE.` otherwise.

---

## PXFISCONST

*Retrieves value associated with a  
 constant name*

---

### Prototype

INTERFACE

LOGICAL(4) FUNCTION PXFISCONST (M)

CHARACTER(LEN=\*) M

```
END FUNCTION PXFISCONST
END INTERFACE
M (input) name of the constant
```

### Description

Retrieves value associated with a constant name. You can inquire about the values of the following symbolic constants:

```
STDIN_UNIT
STDOUT_UNIT
STDERR_UNIT
EINVAL
ENONAME
ENOHANDLE
EARRAYLEN
ETRUNC
```

### Output

A logical value is returned. Returns `.TRUE.` if `M` is one of these constants, `.FALSE.` if not.

---

## PXFISDIR

*Checks if component is a directory*

---

### Prototype

```
INTERFACE
  LOGICAL(4) FUNCTION PXFISDIR (M)
  INTEGER(4) M
  END FUNCTION PXFISDIR
END INTERFACE
```



M	value of the ST_MODE component in the structure PXSTAT (stat)
---	--

## Output

A logical `.TRUE./FALSE.` value that indicates whether the file is a special FIFO file.

---

# PXFISREG

*Checks if a file is a special FIFO file.*

---

## Prototype

```
INTERFACE
  LOGICAL(4) FUNCTION PXFISREG (M)
    INTEGER(4) M
  END FUNCTION PXFISREG
END INTERFACE
```

M                    value of the `ST_MODE` component in the structure `PXFSTAT (stat)`

## Description

This function checks if a `LOGICAL(4)` value is `.TRUE./FALSE.` to determine if the queried file is a special FIFO file. If `PXFISREG` returns true, the file is a regular file.



---

**NOTE.** *On Win32 systems, this function always returns an error code of -1. Win32 does not support symbolic file links.*

---

## Output

A logical `.TRUE./FALSE.` value

---

## PXFKILL

*Kills the specified process.*

---

### Prototype

INTERFACE

SUBROUTINE PXFKILL (IPID, ISIG, IERROR)

INTEGER(4) IPID, ISIG, IERROR

END SUBROUTINE PXFKILL

END INTERFACE

IPID	specifies what process to kill as determined by its value:
> 0	the specific process is killed.
< 0	all processes in the group are killed.
== 0	all processes in the group except special processes are killed.
== pid_t-1	all processes are killed.
ISIG	value of desired signal
IERROR	return value

### Description

This subroutine kills the specified process.

### Output

IERROR contains a nonzero if child process exited normally. On Linux systems, if successful, IERROR returns zero, otherwise IERROR = -1.

---

## PXFLINK

*Links to a file/directory*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFLINK (EXISTING, LENEXIST, NEW,
                     LENNEW, IERROR)
    CHARACTER(LEN=*) EXISTING, NEW
    INTEGER(4) LENEXIST, LENNEW, IERROR
  END SUBROUTINE PXFLINK
END INTERFACE
```

EXISTING	existing file/directory name
LENEXIST	length of EXISTING string
NEW	new file/directory name
LENNEW	length of NEW string
IERROR	error status

### Description

This subroutine links to a file/directory.

### Output

If successful, IERROR is set to zero.

## PXFLOCALTIME

*Converts a given elapsed time in seconds into current system date*

## Prototype

## INTERFACE

```

SUBROUTINE PXFLOCALTIME (STIME, DATEARRAY,
                        IERROR)

```

```
INTEGER(4) ISECNDS, DATEARRAY(9), IERROR
```

END SUBROUTINE PXFLOCALTIME

END INTERFACE

STIME            elapsed time in seconds since 00:00:00 Greenwich  
Mean Time, January 1, 1970.

DATEARRAY will contain current date and system time:

(1) seconds (0-59)

(2) minutes (0-59)

(3) hours (0-23)

(4) day of month (1-31)

(5) month (1-12)

(6) year (Gregorian)(ex. 1990)

(7) day of week (0-6, 0 is Sunday)

(8) day of year (1-366)

(9) daylight savings (1, if in effect; 0, otherwise)

IEERROR	return value
---------	--------------

### Description

Converts a given elapsed time in seconds into current system date.

## Output

If successful, IERROR is set to zero.

---

## PXFLSEEK

*This function positions a file a specified distance in bytes*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFLSEEK (IFILDES, OFFSET, WHENCE,
    POSITION, IERROR)
    INTEGER(4) IFILDES, OFFSET, WHENCE, POSITION,
    IERROR
  END SUBROUTINE PXFLSEEK
END INTERFACE
```

IFILDES	file descriptor
OFFSET	number of bytes to move
WHENCE	starting position
POSITION	(output) ending position
IERROR	returned error code

### Description

This subroutine positions a file a specified distance (OFFSET) in bytes depending upon the input value of WHENCE. Where WHENCE is one of the following:

```
SEEK_SET  0
SEEK_CUR  1
SEEK_END  2
```

If WHENCE is SEEK\_SET, the file is positioned to OFFSET bytes from the beginning of the file. If WHENCE is SEEK\_CUR, the file is positioned to OFFSET bytes from the current position of the file. If WHENCE is SEEK\_END the file is positioned OFFSET bytes beyond the end of the line.

## Output

If successful, IERROR is set to zero.

---

# PXFMKDIR

*Makes a directory*

---

## Prototype

```
INTERFACE
  SUBROUTINE PXFMKDIR (PATH, ILEN, IMODE, IERROR)
    CHARACTER(LEN=*) PATH
    INTEGER(4) ILEN, IMODE, IERROR
  END SUBROUTINE PXFMKDIR
END INTERFACE
```

PATH	the directory to be changed to
ILEN	length of PATH string
IMODE	mode mask
IERROR	return value

## Description

This subroutine creates a directory. IMODE value is processed in the Linux systems only, octal of code of file access is set.

## Output

If successful, IERROR is set to zero.

---

## PXFMKFIFO

*Creates a new FIFO*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFMKFIFO (PATH, ILEN, IMODE,
    IERROR)
    CHARACTER (LEN=*) PATH
    INTEGER(4) ILEN, IMODE, IERROR
  END SUBROUTINE
END INTERFACE
```

PATH	name of FIFO file to create
ILEN	length of PATH string
IMODE	file permission (bits)
IERROR	error status

### Description

This subroutine creates a new FIFO.

### Output

On Linux, if successful, IERROR is set to zero. On Win32 systems if successful, IERROR is not changed.



---

## PXFOPEN

*Opens/creates a file for reading or writing*

---

### Prototype

```

INTERFACE
  SUBROUTINE PXFOPEN (PATH, ILEN, IOPENFLAG,&
    IMODE, IFILDES, IERROR)
    CHARACTER (LEN=*) PATH
    INTEGER(4) ILEN, OPENFLAG, IMODE, IFILDES, IERROR
  END SUBROUTINE
END INTERFACE

PATH          pathname of the file
ILEN          length of PATH string
IOPENFLAG     specifies how to open the file (read/write)
IMODE         mode of the newly-created file, if
              IOPENFLAG = O_CREAT
IFILDES       (output) file descriptor
IERROR        return value

```

### Description

This subroutines creates a file or opens an existing one for read/write.

### Output

If successful, IERROR is set to zero.

---

## PXFOPENDIR

*Opens a directory and associates a stream with it*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFOPENDIR (DIRNAME, LENDIRNAME,
    OPENDIRID, IERROR)
    CHARACTER (LEN=*) DIRNAME
    INTEGER(4) LENDIRNAME, IOPENDIRID, IERROR
  END SUBROUTINE PXFOPENDIR
END INTERFACE
```

DIRNAME	directory name
LENDIRNAME	length of DIRNAME string
OPENDIRID	(out) pointer to DIR structure
IERROR	(out) error status

### Description

This subroutine opens a directory and associates a stream with it.

### Output

If successful, IERROR is set to zero.

---

## PXFPIPE

*Creates a communications pipe between two processes*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFPIPE (IREADFD, IWRITEFD, IERROR)
    INTEGER(4) IREADFD, IWRITEFD, IERROR
  END SUBROUTINE PXFPIPE
END INTERFACE
```

IREADFD            (output) reading file descriptor  
 IWRITEFD          (output) writing file descriptor  
 IERROR            (output) returned error code

### Description

This subroutine creates a communications pipe between two processes.

### Output

If successful, IERROR is set to zero.

---

## PXFPUTC

*Outputs a character to logical unit 6  
(stdout)*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFPUTC (CH, IERROR)
    CHARACTER (LEN=1) CH
    INTEGER(4) IERROR
  END SUBROUTINE PXFPUTC
END INTERFACE
```

CH	character to be written
IERROR	returned error code

### Description

This subroutine outputs a character to logical unit 6 (stdout).

### Output

If successful, IERROR is set to zero. EEND is set if end of file is encountered.

---

# PXFREAD

*Reads from a file*

---

## Prototype

```

INTERFACE
  SUBROUTINE PXFREAD (IFILDES, CHAR, NBYTE, NREAD,
    IERROR)
    INTEGER(4) IFILDES
    CHARACTER(LEN=*) BUF
    INTEGER(4) NBYTE, NREAD, IERROR
  END SUBROUTINE
END INTERFACE

```

IFILDES	descriptor to be read from
CHAR	buffer to be written to
NBYTE	number of bytes to read
NREAD	(output) number of bytes read
IERROR	(output) returned error code

## Description

This subroutine reads a specified number of bytes from a file.

## Output

If successful, IERROR is set to zero. Otherwise, NREAD is undefined if error occurs.

---

## PXFREADDIR

*Reads the current directory entry*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFREADDIR (IDIRID, JDIRENT, IERROR)
    INTEGER(4) IDIRID, JDIRENT, IERROR
  END SUBROUTINE PXFREADDIR
END INTERFACE
```

IDIRID	pointer to DIR structure
JDIRENT	(out) pointer to PXFDIRENT structure
IERROR	(out) error status

### Description

This subroutine reads the current directory entry.

### Output

If successful, IERROR is set to zero.

---

## PXFRENAME

*Changes the name of a file*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFRENAME (OLD, LENOLD, NEW, LENNEW,
    IERROR)
    CHARACTER(LEN=*) OLD, NEW
    INTEGER(4) LENOLD, LENNEW, IERROR
  END SUBROUTINE PXFRENAME
END INTERFACE
```

OLD	old filename
LENOLD	length of OLD string
NEW	new filename
LENNEW	length of NEW string
IERROR	return value

### Description

This subroutine changes the name of file.

## Output

If successful, IERROR is set to zero.

## PXFREWINDDIR

*Resets the position of the stream to the beginning of the directory*

## Prototype

```

INTERFACE
  SUBROUTINE PXFREWINDDIR (IDIRID, IERROR)
    INTEGER(4) IDIRID, IERROR
  END SUBROUTINE PXFREWINDDIR
END INTERFACE

```

IDIRID	pointer to DIR structure
IERROR	(out) error status

### Description

This subroutine resets the position of the stream to the beginning of the directory.

## Output

If successful, IERROR is set to zero.

---

## PXFRMDIR

*Removes a directory*

---

## Prototype

```
INTERFACE
  SUBROUTINE PXFRMDIR (PATH, ILEN, IERROR)
    CHARACTER(LEN=*) PATH
    INTEGER(4) ILEN, IERROR
  END SUBROUTINE PXFRMDIR
END INTERFACE
```

PATH	the directory to be removed
ILEN	length of PATH string
IERROR	return value

## Description

This subroutine removes a directory.

## Output

If successful, IERROR is set to zero.



---

## PXFSIGADDSET

*Adds a signal to the set*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFSIGADDSET (JSIGNET, ISIGNO, IERROR)
    INTEGER(4) JSIGNSET, ISIGNO, IERROR
  END SUBROUTINE PXFSIGADDSET
END INTERFACE
```

JSIGNET            a bit vector structure created via  
                    PXFSTRUCTURECREATE.

ISIGNO            (input) signal to be added to the set

IERROR            return code

### Description

Adds a signal to the set JSIGNET.




---

**NOTE.** *You must use the PXFSTRUCTURECREATE subroutine to create the JSIGNSET structure. JSIGNSET is not inherited by child applications started as a result of PXFFORK.*

---

### Output

If successful, IERROR is set to zero.

---

## PXFSIGDELSET

*Deletes a signal from the set*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFSIGDELSET (JSIGSET, ISIGNO, IERROR)
    INTEGER(4) JSIGSET, ISIGNO, IERROR
  END SUBROUTINE PXFSIGDELSET
END INTERFACE
```

JSIGNET	a set representing a group of signals (obtained with PXFSTRUCTURECREATE )
ISIGNO	(input) signal to be deleted to the set
IERROR	return code

### Description

Deletes the value of a given signal, ISIGNO, from the set JSIGNSET. After the signal has been deleted, any occurrence of the signal will not be “caught” by the application, and will be re-signaled, causing possible fatal application errors.

### Output

If successful, IERROR is set to zero.

---

## PXFSIGEMPTYSET

*Determines whether a signal set is empty.*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFSIGEMPTYSET (JSIGSET, IERROR)
    INTEGER(4) JSIGSET, IERROR
  END SUBROUTINE
END INTERFACE
```

JSIGNET            a set representing a group of signals (obtained with  
                    PXFSTRUCTURECREATE )

IERROR            return code

### Description

Tests to determine whether the set given by JSIGNSET is empty.




---

**NOTE.** *You must use the PXFSTRUCTURECREATE subroutine to create the JSIGNSET structure.*

---

### Output

If successful, IERROR is set to zero; non-zero is set for a non-empty set.

---

## PXFSIGFILLSET

*Fill a signal set.*

---

### Prototype

INTERFACE

    SUBROUTINE PXFSIGFILLSET (JSIGSET, IERROR)

    INTEGER(4) JSIGSET, IERROR

    END SUBROUTINE PXFSIGFILLSET

END INTERFACE

JSIGNET           a set representing a group of signals (obtained with  
                  PXFSTRUCTURECREATE )

IERROR           return code

### Description

This subroutine adds a signal to the JSIGNSET. It is useful for initializing a set.



---

**NOTE.** *You must use the PXFSTRUCTURECREATE subroutine to create the JSIGNSET structure.*

---

### Output

If successful, IERROR is set to zero.

---

## PXFSIGISMEMBER

*Checks if signal is a member of a set*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFSIGISMEMBER (JSIGSET, ISIGNO,
    ISMEMBER,
    IERROR)
    INTEGER(4) JSIGSET, ISIGNO, IERROR
    LOGICAL(4) ISMEMBER
  END SUBROUTINE PXFSIGISMEMBER
END INTERFACE
```

JSIGNET	(input) a set representing a group of signals (obtained with PXFSTRUCTURECREATE)
ISIGNO	(input) signal to be tested for membership
ISMEMBER	(output) logical result
IERROR	(output) return code

### Description

This subroutine checks if the specified signal is a member of the specified set.

### Output

If true, ISMEMBER contains `.TRUE.`. Otherwise, it is set to `.FALSE.`

---

## PXFSTAT

*Gets the status of a file*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFSTAT (PATH, ILEN, JSTAT, IERROR)
    CHARACTER (LEN=*) PATH
    INTEGER(4) ILEN, JSTAT, IERROR
  END SUBROUTINE PXFSTAT
END INTERFACE
```

PATH	(input) file name
ILEN	(input) length of PATH string
JSTAT	(input) pointer to PXFSTAT structure
IERROR	(output) return value

### Description

This subroutine gets the status of a file.

### Output

If successful, IERROR is set to zero.

---

## PXFSTRGET

*Gets an integer component of a structure*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFSTRGET (JHANDLE, COMPNAME, INDEX,
    VALUE, ILEN, IERROR)
    INTEGER(4) JHANDLE, INDEX, ILEN, IERROR
    CHARACTER(LEN=*) COMPNAME, VALUE
  END SUBROUTINE PXFSTRGET
END INTERFACE
```

JHANDLE	handle to the structure
COMPNAME	component name
INDEX	index of the component
VALUE	(out) where the value of the component is stored
ILEN	(out) length of VALUE string
IERROR	return value

### Description

This subroutine gets an integer component of a structure.

### Output

If successful, IERROR is set to zero.

---

## PXFSTRUCTCOPY

*Copies the contents of one structure to another*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFSTRUCTCOPY (STRUCTNAME, JHANDLE1,
    JHANDLE2, IERROR)
    INTEGER(4) JHANDLE1, JHANDLE2, IERROR
    CHARACTER(LEN=*) STRUCTNAME
  END SUBROUTINE PXFSTRUCTCOPY
END INTERFACE
```

STRUCTNAME	(input) structure name
JHANDLE1	(input) handle to the structure to be copied???
JHANDLE2	(input) handle to structure to be copied into???
IERROR	(output) return value

### Description

This subroutine copies the contents of one structure to another.

### Output

If successful, IERROR is set to zero.



---

## PXFSTRUCTCREATE

*Creates an instance of the specified structure*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFSTRUCTCREATE (STRUCTNAME, JHANDLE,
    IERROR)
    CHARACTER (LEN=*) STRUCTNAME
    INTEGER(4) JHANDLE, IERROR
  END SUBROUTINE PXFSTRUCTCREATE
END INTERFACE
```

STRUCTNAME	(input) structure name
JHANDLE	(output) handle to structure
IERROR	(output) return value

### Description

This subroutine creates an instance of the specified structure.

### Output

If successful, IERROR is set to zero.

---

## PXFSTRUCTFREE

*Deletes the instance of a structure*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFSTRUCTFREE (JHANDLE, IERROR)
    INTEGER(4) JHANDLE, IERROR
  END SUBROUTINE PXFSTRUCTFREE
END INTERFACE
```

JHANDLE            (input) handle to structure

IERROR            (output) return value

### Description

This subroutine deletes the instance of a structure.

### Output

If successful, IERROR is set to zero.

---

## PXFUCOMPARE

*Compares two unsigned numbers and  
returns the absolute value of their  
difference*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFUCOMPARE (I1, I2, ICMPR, IDIFF)
    INTEGER(4) I1, I2, ICMPR, IDIFF
  END SUBROUTINE PXFUCOMPARE
END INTERFACE
```

I1, I2	the two unsigned integers to compare
ICMPR	(output) result of comparison (-1,0,1)
IDIFF	(output) absolute value of the difference

### Description

This subroutine compares two unsigned numbers and returns the absolute value of their difference.

## Output

The value of ICMPR upon completion:

-1	if $I1 < I2$
0	if $I1 = I2$
1	if $I1 > I2$

# PXFUMASK

*Sets and gets the file creation mask*

## Prototype

```

INTERFACE
  SUBROUTINE PXFUMASK (ICMASK, IPREVCMASK, IERROR)
    INTEGER(4) ICMASK, IPREVCMASK, IERROR
  END SUBROUTINE PXFUMASK
END INTERFACE

```

ICMASK	(input) set mask
IPREVCMASK	(output) previous mask
IERROR	(output) return value

### Description

This subroutine sets and gets the file creation mask.

**Output**

If successful, IERROR is set to zero.

---

**PXFUNLINK**

*Removes the specified directory entry*

---

**Prototype**

```
INTERFACE
  SUBROUTINE PXFUNLINK (PATH, ILEN, IERROR)
    CHARACTER(LEN=*) PATH
    INTEGER(4) ILEN, IERROR
  END SUBROUTINE PXFUNLINK
END INTERFACE
```

PATH	(input) name of the directory entry
ILEN	(input) length of PATH string
IERROR	(output) return value

**Description**

This subroutine removes the specified directory entry.

**Output**

If successful, IERROR is set to zero.

---

# PXFUTIME

*Sets file access and modification times*

---

## Prototype

```
INTERFACE
  SUBROUTINE PXFUTIME (PATH, ILEN, JUTIMBUG, IERROR)
    CHARACTER (LEN=*) PATH
    INTEGER(4) ILEN, JUTIMBUF, IERROR
  END SUBROUTINE PXFUTIME
END INTERFACE
```

PATH	(input) file name
ILEN	(input) length of PATH string
JUTIMBUG	(input) pointer to PXFUTIMBUF structure
IERROR	(output) return value

## Description

This subroutine sets the file access and modification times.

## Output

If successful, IERROR is set to zero.

---

## PXFWAIT

*Waits for any child process*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFWAIT (ISTATE, IRETPID, IERROR)
    INTEGER(4) ISTAT, IRETPID, IERROR
  END SUBROUTINE PXFWAIT
END INTERFACE
```

ISTATE            (output) status of child process

IRETPID           (input/output) the process ID to wait on when the  
                  function is called; the process ID of the stopped child  
                  process returned

IERROR            (output) error value

### Description

This subroutine waits for any child process.

### Output

If successful, IERROR is set to zero.

---

## PXFWAITPID

*Waits for certain PIDs*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFWAITPID (IPID, ISTAT, IOPTIONS, &
                        IRETPID, IERROR)
    INTEGER(4) IPID, ISTAT, IOPTIONS, IRETPID, IERROR
  END SUBROUTINE PXFWAITPID
```

```

END INTERFACE

IPID          (input) specifies the PIDs to wait for

ISTAT         (output) status of child process

IOPTIONS      (input) on Linux, check
               /usr/include/sys/wait.h for possible values of
               the options. WCONTINUED, WNOHANG, WNOWAIT,
               WUNTRACED. On Win32 systems, check your MSVC
               installation, in the include\process.h file

IRETPID       (output) pid of the stopped child

IERROR        (output) error value

```

### Description

This subroutine waits for certain PIDs.

### Output

The PID and status of the child process that triggered the WAITPID routine to stop waiting.

---

## PXFWIFEXITED

*Determines if a child process has exited.*

---

### Prototype

```

INTERFACE
  LOGICAL(4) FUNCTION PXFWIFEXITED (ISTAT)
  INTEGER(4) ISTAT
  END FUNCTION PXFWIFEXITED
END INTERFACE

ISTAT          (output) an integer status obtained from
               PXFWEXITSTATUS.

```

**Description**

Tests whether a child process has exited.

**Output**

Returns `.TRUE.` if the child process exited, `.FALSE.` otherwise.

---

## PXFWEXITSTATUS

*Returns the current status of the child process*

---

**Prototype**

```
INTERFACE
  LOGICAL(4) FUNCTION PXFWEXITSTATUS ( ISTAT )
    INTEGER(4) ISTAT
  END FUNCTION PXFWEXITSTATUS
END INTERFACE
```

ISTAT (output) an `INTEGER*4` variable.

**Description**

Returns the exit status of a child process created via `PXFFORK`. On input, `ISTAT` contains the process ID of the child process.

**Output**

`ISTAT` is set to the exit status value of the child process which can then be interpreted by `PXFWIFEXITED`, `PXFWIFSIGNALED`, `PXFWTERMSIG`, or `PXFWIFSTOPPED`. If the child process is not found, the function returns `.FALSE.`



---

## PXFWIFSIGNALED

*Determines if a child process has exited  
due to a signal*

---

### Prototype

```
INTERFACE
  LOGICAL(4) FUNCTION PXFWIFSIGNALED ( ISTAT )
    INTEGER(4) ISTAT
  END FUNCTION PXFWIFSIGNALED
END INTERFACE
```

ISTAT                    (output) the status variable returned from a previous call  
to PXFWAIT or PXFWAITPID for a child process.

### Description

PXFWIFSIGNALED evaluates the status code returned from a previous call to PXFWAITPID for a child process. If the child terminated due to an missed signal, PXFWIFSIGNALED returns `.TRUE.`.

### Output

IERRORE is set to zero if a successful inquiry is made. The function result is `.TRUE.` if child PID has exited, `.FALSE.` if the child is still active or suspended.

---

## PXFWIFSTOPPED

*Determines if a child process is currently stopped or suspended*

---

### Prototype

```
INTERFACE
  LOGICAL(4) FUNCTION PXFWIFSTOPPED ( ISTAT )
  INTEGER(4) ISTAT
  END FUNCTION PXFWIFSTOPPED
END INTERFACE
```

ISTAT (output) the status variable returned from a previous call to PXFWAIT or PXFWAITPID for a child process

### Description

PXFWIFSTOPPED evaluates the input status code to determine whether a particular child process is currently stopped.

### Output

IERRO is set to zero if a successful inquiry is made. The function result is `.TRUE.` if child PID has stopped, `.FALSE.` otherwise.

---

## PXFWRITE

*Writes to a file*

---

### Prototype

```
INTERFACE
  SUBROUTINE PXFWRITE (IFILDES, BUF, NBYTE, &
    NWRITTEN, IERROR)
```

```

        INTEGER(4) IFILDES, NBYTE, NWRITTE, IERROR
        CHARACTER BUF(LEN=*)
        END SUBROUTINE PXFWRITE
END INTERFACE

```

IFILDES	(input) descriptor to be written to
BUF	(input) buffer to be written from
NBYTE	(input) number of bytes to write
NWRITTEN	(output) number of bytes written
IERROR	(output) returned error code

### Description

This subroutine writes output to a file.

### Output

If successful, IERROR is set to zero.

---

## PXFWSTOPSIG

*Gets the number of the signal that caused the child process to stop*

---

### Prototype

```

INTERFACE
    LOGICAL(4) FUNCTION PXFWSTOPSIG (ISTAT)
    INTEGER(4) ISTAT
    END FUNCTION PXFWSTOPSIG
END INTERFACE

```

ISTAT	(output) an integer value representing the child process ID on input, and the value of the signal that terminated the child process on output.
-------	--

### Description

This function gets the number of the signal that caused the child process to stop.

## Output

If successful, ISTAT contains the signal value and the function returns `.TRUE.`. Otherwise, the function returns `.FALSE.`, and ISTAT is not changed.

## PXFWTERMSIG

*Gets the number of the signal that caused termination of a child process*

## Prototype

```

INTERFACE
  LOGICAL(4) FUNCTION PXFWTERMSIG (ISTAT)
  INTEGER(4) ISTAT
  END FUNCTION PXFWTERMSIG
END INTERFACE

```

ISTAT (input/output) process ID on input, signal number on output

### Description

This function gets the number of the signal that caused termination of a child process defined by the process ID in `ISTAT` on input.

## Output

If successful, returns `.TRUE.` and the signal value in `ISTAT`. Otherwise returns `.FALSE.` and `ISTAT` is not changed.

# QuickWin Library

---

## 4

This chapter describes procedures that comprise the QuickWin library (`libqwin.lib`). These procedures are made available to the compiler when you invoke the `/MW` option and use the `flib.fd` include file.

The prototypes are described using the `INTERFACE` call, which provides the required information to complete a call to the specified procedure. For descriptions of the `INTERFACE` block and the `/MW` option, see the *Intel Fortran Compiler User's Guide*.

You can use the QuickWin library to compile programs into simple applications for Windows which allow you to call graphic routines, load and save bitmaps, perform edit and other operations available under windows.

To use the QuickWin library, your program must explicitly access this library procedures with this statement:

```
INCLUDE  
"<installation directory>\include\flib.fd"
```

If a procedure does not have a `PROGRAM` statement, then the above statement must appear in each subprogram that makes graphics calls.

This chapter introduces the major groups of QuickWin library procedures described in the following sections:

- QuickWin subroutines and functions
- Graphics subroutines and functions

## QuickWin Subroutines and Functions

This category includes subroutines and functions that provide windows control and configuration, enhance QuickWin applications and perform color conversion. To use the procedures of this group, add the following statement to the program unit containing the procedure:

```
INCLUDE
"<installation directory>\include\flib.fd"
```

**Table 4-1 QuickWin Routines**

Name/Syntax	Subroutine / Function	Description
<b>Windows Control</b>		
<b>FOCUSQQ</b> result = FOCUSQQ (iunit)	Function	Sets focus to specified window.
<b>GETACTIVEQQ</b> result = GETACTIVEQQ ( )	Function	Returns the unit number of the currently active child.
<b>GETHWNDDQQ</b> result = GETHWNDDQQ (unit)	Function	Converts the unit number into a Windows handle for functions that require it.
<b>GETWINDOWCONFIG</b> result = GETWINDOWCONFIG (wc)	Function	Returns current window properties.
<b>GETWSIZEQQ</b> result = GETWSIZEQQ (unit, ireq, winfo)	Function	Returns the size and position of a window.
<b>INQFOCUSQQ</b> result = INQFOCUSQQ (unit)	Function	Determines which window has focus.
<b>SETACTIVEQQ</b> result = SETACTIVEQQ (unit)	Function	Makes a child window active, but does not give it focus.
<b>SETWINDOWCONFIG</b> result = SETWINDOWCONFIG (wc)	Function	Sets current window properties.
<b>SETWSIZEQQ</b> result = SETWSIZEQQ (unit, winfo)	Function	Sets the size and position of a window.

continued

**Table 4-1 QuickWin Routines (continued)**

Name/Syntax	Subroutine / Function	Description
<b>QuickWin Applications Enhancements</b>		
<b>ABOUTBOXQQ</b> <code>result = ABOUTBOXQQ (cstring)</code>	Function	Adds an About Box with customized text.
<b>APPENDMENUQQ</b> <code>result = APPENDMENUQQ (menuID, flags, text, routine)</code>	Function	Appends a menu item.
<b>CLICKMENUQQ</b> <code>result = CLICKMENUQQ (item)</code>	Function	Simulates the effect of clicking or selecting a menu item.
<b>DELETEMENUQQ</b> <code>result = DELETEMENUQQ (menuID, itemID)</code>	Function	Deletes a menu item.
<b>GETEXITQQ</b> <code>result = GETEXITQQ ( )</code>	Function	Returns the setting for a QuickWin application's exit behavior.
<b>INCHARQQ</b> <code>result = INCHARQQ ( )</code>	Function	Reads a single character input from the keyboard and returns the ASCII value of that character without any buffering.
<b>INITIALSETTINGS</b> <code>result = INITIALSETTINGS ( )</code>	Function	Controls initial menu settings and initial frame window.
<b>INSERTMENUQQ</b> <code>result = INSERTMENUQQ (menuID, itemID, flag, text, routine)</code>	Function	Inserts a menu item.
<b>MESSAGEBOXQQ</b> <code>result = MESSAGEBOXQQ (msg, caption, mtype)</code>	Function	Displays a message box.
<b>MODIFYMENUFLAGSQQ</b> <code>result = MODIFYMENUFLAGSQQ (menuID, itemID, flag)</code>	Function	Modifies a menu item's state.

continued

**Table 4-1 QuickWin Routines** (continued)

<b>Name/Syntax</b>	<b>Subroutine / Function</b>	<b>Description</b>
<b>MODIFYMENUROUTINEQQ</b> result = MODIFYMENUROUTINEQQ (menuID, itemID, routine)	Function	Modifies a menu item's callback routine.
<b>MODIFYMENUSTRINGQQ</b> result = MODIFYMENUSTRINGQQ (menuID, itemID, text)	Function	Modifies a menu item's text string.
<b>REGISTERMOUSEEVENT</b> result = REGISTERMOUSEEVENT (unit, mouseevents, callbackroutine)	Function	Registers the application defined routines to be called on mouse events.
<b>SETEXITQQ</b> result = SETEXITQQ (exitmode)	Function	Sets a QuickWin application's exit behavior.
<b>SETMESSAGEQQ</b> CALL SETMESSAGEQQ (msg, id)	Subroutine	Changes any QuickWin message, including status bar messages, state messages, and dialog box messages.
<b>SETWINDOWMENUQQ</b> result = SETWINDOWMENUQQ (menuID)	Function	Sets the menu to which a list of current child window names are appended.
<b>UNREGISTERMOUSEEVENT</b> result = UNREGISTERMOUSEEVENT (unit, mouseevents)	Function	Removes the routine registered by REGISTERMOUSEEVENT.
<b>WAITONMOUSEEVENT</b> result = WAITONMOUSEEVENT (mouseevents, keystate, x, y)	Function	Blocks a return until a mouse event occurs.
<b>Color Conversion</b>		
<b>INTEGERTORGB</b> CALL INTEGERTORGB (rgb, red, green, blue)	Subroutine	Converts an RGB color value to its red, green, and blue components

continue



**Table 4-1 QuickWin Routines** (continued)

Name/Syntax	Subroutine / Function	Description
<b>RGBTOINTEGER</b> <code>result = RGBTOINTEGER (red, green, blue)</code>	Function	Converts integers specifying red, green, and blue color into an RGB integer (for use in RGB routines).

## Graphics Procedures

The QuickWin run-time library helps you turn graphics programs into simple Windows applications. QuickWin applications support pixel-based graphics, real-coordinate graphics, text windows, character fonts, user-defined menus, mouse events, and editing (select/copy/paste) of text, graphics, or both.

To use the QuickWin library, invoke the compiler driver with the option `/MW` to link to the QuickWin library, `libqwin.lib`, and add the following statement to the program unit containing the QuickWin procedure(s):

```
INCLUDE  
"<installation directory>\include\flib.fd"
```

When QuickWin is not being used, you link by default to the library `libqwind.lib` instead. This library consists of dummy versions of QuickWin functions to avoid unresolved references at link time.

Note that QuickWin applications cannot be DLLs and QuickWin cannot be linked with runtime routines that are in DLLs.

Table 4-2 summarizes the Graphics procedures. When writing your applications, you can use any case.

**Table 4-2 Graphics Routines and Functions Summary**

Name/Syntax	Subroutine / Function	Description
<b>ARC, ARC_W</b> <code>result = ARC (x1, y1, x2, y2, x3, y3, x4, y4)</code> <code>result = ARC_W (wx1, wy1, wx2, wy2, wx3, wy3, wx4, wy4)</code>	Function	Draws an arc.
<b>CLEARSCREEN</b> <code>CALL CLEARSCREEN (area)</code>	Subroutine	Clears the screen, viewport, or text window.
<b>DISPLAYCURSOR</b> <code>result = DISPLAYCURSOR (toggle)</code>	Function	Graphics Function Turns the cursor off and on.
<b>ELLIPSE, ELLIPSE_W</b> <code>result = ELLIPSE (control, x1, y1, x2, y2)</code> <code>result = ELLIPSE_W (control, wx1, wy1, wx2, wy2)</code>	Function	Draws an ellipse or circle
<b>FLOODFILL, FLOODFILL_W</b> <code>result = FLOODFILL (x, y, bcolor)</code> <code>result = FLOODFILL_W (wx, wy, bcolor)</code>	Function	Fills an enclosed area of the screen with the current color index, using the current fill mask.
<b>FLOODFILLRGB, FLOODFILLRGB_W</b> <code>result = FLOODFILLRGB (x, y, color)</code> <code>result = FLOODFILLRGB_W (wx, wy, color)</code>	Function	Fills an enclosed area of the screen with the current RGB color, using the current.
<b>GETARCINFO</b> <code>result = GETARCINFO (pstart, pend, ppaint)</code>	Function	Determines the end points of the most recently drawn arc or pie.
<b>GETBKCOLOR</b> <code>result = GETBKCOLOR ( )</code>	Function	Returns the current background color index.

continued

**Table 4-2 Graphics Routines and Functions Summary** (continued)

Name/Syntax	Subroutine / Function	Description
<b>GETBKCOLORRGB</b> result = GETBKCOLORRGB ( )	Function	Returns the current background RGB color.
<b>GETCOLOR</b> result = GETCOLOR ( )	Function	Returns the current color index.
<b>GETCOLORRGB</b> result = GETCOLORRGB ( )	Function	Returns the current RGB color.
<b>GETCURRENTPOSITION, GETCURRENTPOSITION_W</b> CALL GETCURRENTPOSITION (t) CALL GETCURRENTPOSITION_W (wt)	Subroutine	Returns the coordinates of the current graphics-output position.
<b>GETFILLMASK</b> CALL GETFILLMASK (mask)	Subroutine	Returns the current fill mask
<b>GETFONTINFO</b> result = GETFONTINFO (font)	Function	Returns the current font characteristics.
<b>GETGTEXTTEXTENT</b> result = GETGTEXTTEXTENT (text)	Function	Determines the width of the specified text in the current font.
<b>GETGTEXTROTATION</b> result = GETGTEXTROTATION ( )	Function	Get the current text rotation angle.
<b>GETIMAGE, GETIMAGE_W</b> CALL GETIMAGE (x1, y1, x2, y2, image) CALL GETIMAGE_W (wx1, wy1, wx2, wy2, image)	Subroutine	Stores a screen image in memory.
<b>GETLINESTYLE</b> result = GETLINESTYLE ( )	Function	Returns the current line style.
<b>GETPHYSCOORD</b> CALL GETPHYSCOORD (x, y, t)	Subroutine	Converts viewport coordinates to physical coordinates.

continued

**Table 4-2 Graphics Routines and Functions Summary** (continued)

Name/Syntax	Subroutine / Function	Description
<b>GETPIXEL, GETPIXEL_W</b> <code>result = GETPIXEL (x, y)</code> <code>result = GETPIXEL_W (wx, wy)</code>	Function	Returns a pixel's color index.
<b>GETPIXELRGB, GETPIXELRGB_W</b> <code>result = GETPIXELRGB (x, y)</code> <code>result = GETPIXELRGB_W (wx, wy)</code>	Function	Returns a pixel's RGB color.
<b>GETPIXELS</b> <code>CALL GETPIXELS (n, x, y, color)</code>	Function	Returns the color indices of multiple pixels.
<b>GETPIXELSRGB</b> <code>CALL GETPIXELSRGB (n, x, y, color)</code>	Function	Returns the RGB colors of multiple pixels.
<b>GETTEXTCOLOR</b> <code>result = GETTEXTCOLOR ( )</code>	Function	Returns the current text color index
<b>GETTEXTCOLORRGB</b> <code>result = GETTEXTCOLORRGB ( )</code>	Function	Returns the current text RGB color.
<b>GETTEXTPOSITION</b> <code>CALL GETTEXTPOSITION (t)</code>	Subroutine	Returns the current text-output position.
<b>GETTEXTWINDOW</b> <code>CALL GETTEXTWINDOW (r1, c1, r2, c2)</code>	Subroutine	Returns the boundaries of the current text window.
<b>GETVIEWCOORD, GETVIEWCOORD_W</b> <code>CALL GETVIEWCOORD (x, y, t)</code> <code>CALL GETVIEWCOORD_W (wx, wy, wt)</code>	Subroutine	Converts physical or window coordinates to viewport coordinates.
<b>GETWINDOWCOORD</b> <code>CALL GETWINDOWCOORD (x, y, wt)</code>	Subroutine	Converts viewport coordinates to window coordinates.
<b>GETWRITEMODE</b> <code>result = GETWRITEMODE ( )</code>	Function	Returns the logical write mode for lines.

continued

**Table 4-2 Graphics Routines and Functions Summary** (continued)

Name/Syntax	Subroutine / Function	Description
<b>GRSTATUS</b> result = GRSTATUS ( )	Function	Returns the status (success or failure) of the most recently called graphics routine.
<b>IMAGE_SIZE, IMAGE_SIZE_W</b> result = IMAGE_SIZE (x1, y1, x2, y2) result = IMAGE_SIZE_W (wx1, wy1, wx2, wy2)	Function	Returns image size in bytes.
<b>INITIALIZE_FONTS</b> result = INITIALIZE_FONTS ( )	Function	Initializes the font library.
<b>LINETO, LINETO_W</b> result = LINETO (x, y) result = LINETO_W (wx, wy)	Function	Draws a line from the current position to a specified point.
<b>LOADIMAGE, LOADIMAGE_W</b> result = LOADIMAGE (filename, xcoord, ycoord) result = LOADIMAGE_W (filename, wxcoord, wycoord)	Function	Reads a Windows bitmap file (.BMP) and displays it at the specified location.
<b>MOVETO, MOVETO_W</b> CALL MOVETO (x, y, t) CALL MOVETO_W (wx, wy, w)	Subroutine	Moves the current position to the specified point.
<b>OUTGTEXT</b> CALL OUTGTEXT (text)	Subroutine	Sends text in the current font to the screen at the current position.
<b>OUTTEXT</b> CALL OUTTEXT (text)	Subroutine	Sends text to the screen at the current position.

continued

**Table 4-2 Graphics Routines and Functions Summary** (continued)

Name/Syntax	Subroutine / Function	Description
<b>PIE, PIE_W</b> <code>result = PIE (i, x1, y1, x2, y2, x3, y3, x4, y4)</code> <code>result = PIE_W (i, wx1, wy1, wx2, wy2, wx3, wy3, wx4, wy4)</code>	Function	Draws a pie slice.
<b>POLYGON, POLYGON_W</b> <code>result = POLYGON (control, ppoints, cpoints)</code> <code>result = POLYGON_W (control, wppoints, cpoints)</code>	Function	Draws a polygon.
<b>PUTIMAGE, PUTIMAGE_W</b> <code>CALL PUTIMAGE (x, y, image, action)</code> <code>CALL PUTIMAGE_W (wx, wy, image, action)</code>	Subroutine	Retrieves an image from memory and displays it.
<b>RECTANGLE, RECTANGLE_W</b> <code>result = RECTANGLE (control, x1, y1, x2, y2)</code> <code>result = RECTANGLE_W (control, wx1, wy1, wx2, wy2)</code>	Function	Draws a rectangle.
<b>REMAPALLPALETTERGB</b> <code>result = REMAPALLPALETTERGB (colors)</code>	Function	Remaps a set of RGB color values to indices recognized by the current video configuration.
<b>REMAPPALLETTERGB</b> <code>result = REMAPPALLETTERGB (index, color)</code>	Function	Remaps a single RGB color value to a color index.

continued

**Table 4-2 Graphics Routines and Functions Summary** (continued)

Name/Syntax	Subroutine / Function	Description
<b>SAVEIMAGE, SAVEIMAGE_W</b> <code>result = SAVEIMAGE (filename,          ulxcoord, ulycoord, lrxcoord,          lrycoord)          result = SAVEIMAGE_W (filename,          ulwxcoord, ulwycoord,          lrwxcoord, lrwycoord)</code>	Function	Captures a screen image and saves it as a Windows bitmap file.
<b>SAVEJPEG, SAVEJPEG_W</b> <code>result = SAVEJPEG (filename,          ulxcoord, ulycoord, lrxcoord,          lrycoord, jpgquality)          result = SAVEJPEG_W (filename,          ulwxcoord, ulwycoord,          lrwxcoord, lrwycoord,          jpgwquality)</code>	Function	Captures a screen image and saves it into a JPEG graphic file.
<b>SCROLLTEXTWINDOW</b> <code>CALL SCROLLTEXTWINDOW (rows)</code>	Function	Scrolls the contents of a text window.
<b>SETBKCOLOR</b> <code>result = SETBKCOLOR (color)</code>	Function	Sets the current background color.
<b>SETBKCOLORRRGB</b> <code>result = SETBKCOLORRRGB (color)</code>	Function	Sets the current background color to a direct color value rather than an index to a defined palette.
<b>SETCLIPRGN</b> <code>CALL SETCLIPRGN (x1, y1, x2,          x2)</code>	Subroutine	Limits graphics output to a part of the screen.
<b>SETCOLOR</b> <code>result = SETCOLOR (color)</code>	Function	Sets the current color to a new color index.
<b>SETCOLORRRGB</b> <code>result = SETCOLORRRGB (color)</code>	Function	Sets the current color to a direct color value rather than an index to a defined palette.

continued

**Table 4-2 Graphics Routines and Functions Summary** (continued)

Name/Syntax	Subroutine / Function	Description
<b>SETFILLMASK</b> CALL SETFILLMASK ( <i>mask</i> )	Subroutine	Changes the current fill mask to a new pattern.
<b>SETFONT</b> result = SETFONT ( <i>options</i> )	Function	Finds a single font matching the specified characteristics and assigns it to OUTGTEXT.
<b>SETGTEXTROTATION</b> CALL SETGTEXTROTATION ( <i>degrees</i> )	Subroutine	Sets the direction in which text is written to the specified angle.
<b>SETLINESTYLE</b> CALL SETLINESTYLE ( <i>mask</i> )	Subroutine	Changes the current line style.
<b>SETPIXEL, SETPIXEL_W</b> result = SETPIXEL ( <i>x, y</i> ) result = SETPIXEL_W ( <i>wx, wy</i> )	Function	Sets color of a pixel at a specified location.
<b>SETPIXELRGB, SETPIXELRGB_W</b> result = SETPIXELRGB ( <i>x, y, color</i> ) result = SETPIXELRGB_W ( <i>wx, wy, color</i> )	Function	Sets RGB color of a pixel at a specified location.
<b>SETPIXELS</b> CALL SETPIXELS ( <i>n, x, y, color</i> )	Subroutine	Sets the color indices of multiple pixels.
<b>SETPIXELSRGB</b> CALL SETPIXELSRGB ( <i>n, x, y, color</i> )	Subroutine	Sets the RGB color of multiple pixels.
<b>SETTEXTCOLOR</b> result = SETTEXTCOLOR ( <i>index</i> )	Function	Sets the current text color to a new color index.
<b>SETTEXTCOLORRRGB</b> result = SETTEXTCOLORRRGB ( <i>color</i> )	Function	Sets the current text color to a direct color value rather than an index to a defined palette.

continued



**Table 4-2      Graphics Routines and Functions Summary** (continued)

<b>Name/Syntax</b>	<b>Subroutine / Function</b>	<b>Description</b>
<b>SETTEXTPOSITION</b> CALL SETTEXTPOSITION ( <i>row</i> , <i>column</i> , <i>t</i> )	Subroutine	Changes the current text position.
<b>SETTEXTWINDOW</b> CALL SETTEXTWINDOW ( <i>r1</i> , <i>c1</i> , <i>r2</i> , <i>c2</i> )	Subroutine	Sets the current text display window.
<b>SETVIEWORG</b> CALL SETVIEWORG ( <i>x</i> , <i>y</i> , <i>t</i> )	Subroutine	Positions the viewport coordinate origin.
<b>SETVIEWPORT</b> CALL SETVIEWPORT ( <i>x1</i> , <i>y1</i> , <i>x2</i> , <i>y2</i> )	Subroutine	Defines the size and screen position of the viewport.
<b>SETWINDOW</b> <i>result</i> = SETWINDOW ( <i>finvert</i> , <i>wx1</i> , <i>wy1</i> , <i>wx2</i> , <i>wy2</i> )	Function	Defines the window coordinate system.
<b>SETWRITEMODE</b> <i>result</i> = SETWRITEMODE ( <i>wmode</i> )	Function	Changes the current logical write mode for lines.
<b>WRAPON</b> <i>result</i> = WRAPON ( <i>option</i> )	Function	Turns line wrapping on or off.

## Graphic Function Descriptions

---

### ARC

*Draws elliptical arcs using the current graphics color*

---

#### Prototype

```
INTERFACE
```

```
    FUNCTION ARC ( X1, Y1, X2, Y2, X3, Y3, X4, Y4 )
```

```
    INTEGER ( 2 ) ARC, X1, Y1, X2, Y2, X3, Y3, X4, Y4
```

```
    END FUNCTION
```

```
END INTERFACE
```

X1, Y1	Input. INTEGER ( 2 ). Viewport coordinates for upper-left corner of bounding rectangle.
X2, Y2	Input. INTEGER ( 2 ). Viewport coordinates for lower-right corner of bounding rectangle.
X3, Y3	Input. INTEGER ( 2 ). Viewport coordinates of start vector.
X4, Y4	Input. INTEGER ( 2 ). Viewport coordinates of end vector.

#### Description

This function draws elliptical arcs using the current graphics color. The center of the arc is the center of the bounding rectangle defined by the points (X1, Y1) and (X2, Y2).

The arc starts where it intersects an imaginary line extending from the center of the arc through (X3, Y3). It is drawn counterclockwise about the center of the arc, ending where it intersects an imaginary line extending from the center of the arc through (X4, Y4).

ARC uses the view-coordinate system. The arc is drawn using the current color.

## Output

The result type is `INTEGER( 2 )`. It is nonzero if successful; otherwise, 0. If the arc is clipped or partially out of bounds, the arc is considered successfully drawn and the return is 1. If the arc is drawn completely out of bounds, the return is 0.

---

## ARC\_W

*Draws elliptical arcs using the current graphics color*

---

### Prototype

INTERFACE

    FUNCTION ARC\_W(WX1,WY1,WX2,WY2,WX3,WY3,WX4,WY4)

    INTEGER( 2 ) ARC\_W

    DOUBLE PRECISION WX1,WY1,WX2,WY2,WX3,WY3,WX4,WY4

    END FUNCTION

END INTERFACE

WX1 , WY1	Input. REAL( 8 ). Window coordinates for upper-left corner of bounding rectangle.
WX2 , WY2	Input. REAL( 8 ). Window coordinates for lower-right corner of bounding rectangle.
WX3 , WY3	Input. REAL( 8 ). Window coordinates of start vector.
WX4 , WY4	Input. REAL( 8 ). Window coordinates of end vector.

### Description

This function draws elliptical arcs using the current graphics color. The center of the arc is the center of the bounding rectangle defined by the points (WX1, WY1) and (WX2, WY2).

The arc starts where it intersects an imaginary line extending from the center of the arc through (WX3, WY3). It is drawn counterclockwise about the center of the arc, ending where it intersects an imaginary line extending from the center of the arc through (WX4, WY4).

ARC\_W uses the view-coordinate system. The arc is drawn using the current color.

### Output

The result type is `INTEGER( 2 )`. It is nonzero if successful; otherwise, 0. If the arc is clipped or partially out of bounds, the arc is considered successfully drawn and the return is 1. If the arc is drawn completely out of bounds, the return is 0.

---

## GETARCINFO

*Determines the endpoints (in viewport coordinates) of the most recently drawn arc or pie.*

---

### Prototype

```
INTERFACE
  FUNCTION GETARCINFO( LPSTART, LPEND, LPPAINT )
    INTEGER( 2 ) GETARCINFO
    STRUCTURE /XYCOORD/
      INTEGER( 2 ) XCOORD
      INTEGER( 2 ) YCOORD
    END STRUCTURE
    RECORD /XYCOORD/ LPSTART
    RECORD /XYCOORD/ LPEND
    RECORD /XYCOORD/ LPPAINT
  END FUNCTION
END INTERFACE
```

---

LPSTART	Output. Derived type XYCOORD. Viewport coordinates of the starting point of the arc.
LPEND	Output. Derived type XYCOORD. Viewport coordinates of the end point of the arc.
LPPAINT	Output. Derived type XYCOORD. Viewport coordinates of the point at which the fill begins.

### Description

GETARCINFO updates the LPSTART and LPEND XYCOORD derived types to contain the endpoints (in viewport coordinates) of the arc drawn by the most recent call to the ARC or PIE functions. The XYCOORD derived type, defined is:

```
TYPE XYCOORD
  INTEGER( 2 ) XCOORD
  INTEGER( 2 ) YCOORD
END TYPE XYCOORD
```

The returned value in LPPAINT specifies a point from which a pie can be filled. You can use this to fill a pie in a color different from the border color. After a call to GETARCINFO, change colors using SETCOLORRGB. Use the new color, along with the coordinates in LPPAINT, as arguments for the FLOODFILLRGB function.

### Output

The result type is INTEGER( 2 ). The result is nonzero if successful. The result is zero if neither the ARC nor the PIE function has been successfully called since the last time CLEARSCREEN or SETWINDOWCONFIG was successfully called, or since a new viewport was selected.

---

## CLEARSCREEN

*Erases the target area and fills it with the current background color*

---

### Prototype

```
INTERFACE
  SUBROUTINE CLEARSCREEN( AREA )
    INTEGER( 2 ) AREA
  END SUBROUTINE
END INTERFACE
```

AREA                    Input. INTEGER( 4 ). Identifies the target area.

### Description

Parameter AREA identifies the target area. Must be one of the following symbolic constants (defined in `flib.fd`):

\$GCLEARSCREEN	Clears the entire screen.
\$GVIEWPORT	Clears only the current viewport.
\$GWINDOW	Clears only the current text window (set with SETTEXTWINDOW).

All pixels in the target area are set to the color specified with SETBKCOLORRGB. The default color is black.

### Output

None

---

## DISPLAYCURSOR

*Controls cursor visibility*

---

### Prototype

INTERFACE

    FUNCTION DISPLAYCURSOR(TOGGLE)

    INTEGER(2) DISPLAYCURSOR, TOGGLE

    END FUNCTION

END INTERFACE

TOGGLE           Input. INTEGER(2). Constant that defines the cursor state. Has two values:

    \$GCURSOROFF

        Makes the cursor invisible regardless of its current shape and mode.

    \$GCURSORON

        Makes the cursor always visible in graphics mode.

### Description

The function controls cursor visibility. Has these two values:

Cursor settings hold only for the currently active child window. You need to call DISPLAYCURSOR for each window in which you want the cursor to be visible.

A call to SETWINDOWCONFIG turns off the cursor.

### Output

The result is the previous value of TOGGLE.

---

## ELLIPSE

*Draws a circle or an ellipse using the current graphics color.*

---

### Prototype

```
INTERFACE
  FUNCTION ELLIPSE( CONTROL, X1, Y1, X2, Y2 )
    INTEGER(2) ELLIPSE, CONTROL, X1, Y1, X2, Y2
  END FUNCTION
```

```
END INTERFACE
```

**CONTROL**      Input. `INTEGER( 2 )`. Fill flag. Can be one of the following symbolic constants:

`$GFILLINTERIOR`

Fills the figure using the current color and fill mask.

`$GBORDER`      Does not fill the figure.

**X1, Y1**      Input. `INTEGER( 2 )`. Viewport coordinates for upper-left corner of bounding rectangle.

**X2, Y2**      Input. `INTEGER( 2 )`. Viewport coordinates for lower-right corner of bounding rectangle.

### Description

When you use `ELLIPSE`, the center of the ellipse is the center of the bounding rectangle defined by the viewport-coordinate points (X1, Y1) and (X2, Y2). If the bounding-rectangle arguments define a point or a vertical or horizontal line, no figure is drawn.

The control option given by `$GFILLINTERIOR` is equivalent to a subsequent call to the `FLOODFILLRGB` function using the center of the ellipse as the start point and the current color (set by `SETCOLORRGB`) as the boundary color. The border is drawn in the current color and line style.



## Output

The result type is `INTEGER(2)`. The result is nonzero if successful; otherwise, 0. If the ellipse is clipped or partially out of bounds, the ellipse is considered successfully drawn, and the return is 1. If the ellipse is drawn completely out of bounds, the return is 0.

---

## ELLIPSE\_W

*Draws a circle or an ellipse using the current graphics color.*

---

## Prototype

```
INTERFACE
```

```
    FUNCTION ELLIPSE_W(CONTROL, WX1, WY1, WX2, WY2)
```

```
    INTEGER(2) ELLIPSE_W, CONTROL
```

```
    DOUBLE PRECISION WX1, WY1, WX2, WY2
```

```
    END FUNCTION
```

```
END INTERFACE
```

CONTROL	Input. <code>INTEGER(2)</code> . Fill flag. Can be one of the following symbolic constants:				
	<table> <tbody> <tr> <td><code>\$GFILLINTERIOR</code></td> <td>Fills the figure using the current color and fill mask.</td> </tr> <tr> <td><code>\$GBORDER</code></td> <td>Does not fill the figure.</td> </tr> </tbody> </table>	<code>\$GFILLINTERIOR</code>	Fills the figure using the current color and fill mask.	<code>\$GBORDER</code>	Does not fill the figure.
<code>\$GFILLINTERIOR</code>	Fills the figure using the current color and fill mask.				
<code>\$GBORDER</code>	Does not fill the figure.				
WX1, WY1	Input. <code>REAL(8)</code> . Window coordinates for upper-left corner of bounding rectangle.				
WX2, WY2	Input. <code>REAL(8)</code> . Window coordinates for lower-right corner of bounding rectangle.				

### Description

When you use ELLIPSE\_W, the center of the ellipse is the center of the bounding rectangle defined by the window-coordinate points (WX1, WY1) and (WX2, WY2). If the bounding-rectangle arguments define a point or a vertical or horizontal line, no figure is drawn.

The control option given by \$GFILLINTERIOR is equivalent to a subsequent call to the FLOODFILLRGB function using the center of the ellipse as the start point and the current color (set by SETCOLORRGB) as the boundary color.

The border is drawn in the current color and line style.

### Output

The result type is INTEGER( 2 ). The result is nonzero if successful; otherwise, 0. If the ellipse is clipped or partially out of bounds, the ellipse is considered successfully drawn, and the return is 1. If the ellipse is drawn completely out of bounds, the return is 0.

---

## FLOODFILL

*Fills an area using the current color index and fill mask.*

---

### Prototype

```
INTERFACE
  FUNCTION FLOODFILL(X,Y,BOUNDARY)
    INTEGER(2) FLOODFILL, X, Y, BOUNDARY
  END FUNCTION
END INTERFACE
```

X, Y	Input. INTEGER( 2 ). Viewport coordinates for fill starting point.
BCOLOR	Input. INTEGER( 2 ). Color index of the boundary color.

## Description

FLOODFILL begins filling at the viewport-coordinate point (X, Y). The fill color used by FLOODFILL is set by SETCOLOR. You can obtain the current fill color index by calling GETCOLOR. These functions allow access only to the colors in the palette (256 or less). To access all available colors on a VGA (262,144 colors) or a true color system, use the RGB functions FLOODFILLRGB and FLOODFILLRGB\_W.

If the starting point lies inside a figure, the interior is filled; if it lies outside a figure, the background is filled. In both cases, the fill color is the current graphics color index set by SETCOLOR. The starting point must be inside or outside the figure, not on the figure boundary itself. Filling occurs in all directions, stopping at pixels of the boundary color BCOLOR.

## Output

The result type is INTEGER(2). The result is a nonzero value if successful; otherwise, 0 (occurs if the fill could not be completed, or if the starting point lies on a pixel with the boundary color BCOLOR, or if the starting point lies outside the clipping region).

---

# FLOODFILL\_W

*Fills an area using the current color index and fill mask.*

---

## Prototype

```
INTERFACE
  FUNCTION FLOODFILL_W(WX1,WY1,BOUNDARY)
    INTEGER(2) FLOODFILL_W, BOUNDARY
    DOUBLE PRECISION WX1, WY1
  END FUNCTION
END INTERFACE
```

<code>WX1 , WY1</code>	Input. <code>REAL ( 8 )</code> . Window coordinates for fill starting point.
<code>BCOLOR</code>	Input. <code>INTEGER ( 2 )</code> . Color index of the boundary color.

### Description

`FLOODFILL_W` begins filling at the window-coordinate point (`WX1 , WY1`). The fill color used by `FLOODFILL_W` is set by `SETCOLOR`. You can obtain the current fill color index by calling `GETCOLOR`. These functions allow access only to the colors in the palette (256 or less). To access all available colors on a VGA (262,144 colors) or a true color system, use the RGB functions `FLOODFILLRGB` and `FLOODFILLRGB_W`.

If the starting point lies inside a figure, the interior is filled; if it lies outside a figure, the background is filled. In both cases, the fill color is the current graphics color index set by `SETCOLOR`. The starting point must be inside or outside the figure, not on the figure boundary itself. Filling occurs in all directions, stopping at pixels of the boundary color `BCOLOR`.

### Output

The result type is `INTEGER ( 2 )`. The result is a nonzero value if successful; otherwise, 0 (occurs if the fill could not be completed, or if the starting point lies on a pixel with the boundary color `BCOLOR`, or if the starting point lies outside the clipping region).

---

## FLOODFILLRGB

*Fills an area using the current Red-Green-Blue (RGB) color and fill mask.*

---

### Prototype

```
INTERFACE
  FUNCTION FLOODFILLRGB (X, Y, BCOLOR)
    INTEGER(2) FLOODFILLRGB, X, Y
    INTEGER(4) BCOLOR
  END FUNCTION
END INTERFACE
```

**X, Y**            Input. `INTEGER(2)`. Viewport coordinates for fill starting point.

**BCOLOR**        Input. `INTEGER(4)`. RGB value of the boundary color.

### Description

`FLOODFILLRGB` begins filling at the viewport-coordinate point (X, Y). The fill color used by `FLOODFILLRGB` is set by `SETCOLORRGB`. You can obtain the current fill color by calling `GETCOLORRGB`.

If the starting point lies inside a figure, the interior is filled; if it lies outside a figure, the background is filled. In both cases, the fill color is the current color set by `SETCOLORRGB`. The starting point must be inside or outside the figure, not on the figure boundary itself. Filling occurs in all directions, stopping at pixels of the boundary color *color*.

### Output

The result type is `INTEGER(4)`. The result is a nonzero value if successful; otherwise, 0 (occurs if the fill could not be completed, or if the starting point lies on a pixel with the boundary color `BCOLOR`, or if the starting point lies outside the clipping region).

---

## FLOODFILLRGB\_W

*Fills an area using the current  
Red-Green-Blue (RGB) color and fill mask.*

---

### Prototype

```
INTERFACE
  FUNCTION FLOODFILLRGB_W(WX,WY,BCOLOR)
    INTEGER(2) FLOODFILLRGB_W
    DOUBLE PRECISION WX,WY
    INTEGER(4) BCOLOR
  END FUNCTION
END INTERFACE
```

WX, WY            Input. REAL( 8 ). Window coordinates for fill starting point.

BCOLOR            Input. INTEGER( 4 ). RGB value of the boundary color.

### Description

FLOODFILLRGB\_W begins filling at the window-coordinate point (WX, WY). The fill color used by FLOODFILLRGB\_W is set by SETCOLORRGB. You can obtain the current fill color by calling GETCOLORRGB.

If the starting point lies inside a figure, the interior is filled; if it lies outside a figure, the background is filled. In both cases, the fill color is the current color set by SETCOLORRGB. The starting point must be inside or outside the figure, not on the figure boundary itself. Filling occurs in all directions, stopping at pixels of the boundary color, BCOLOR.

### Output

The result type is INTEGER( 4 ). The result is a nonzero value if successful; otherwise, 0 (occurs if the fill could not be completed, or if the starting point lies on a pixel with the boundary color *color*, or if the starting point lies outside the clipping region).

---

## GETBKCOLOR

*Gets the current background color index for both text and graphics output.*

---

### Prototype

```
INTERFACE
  FUNCTION GETBKCOLOR ( )
    INTEGER ( 4 ) GENBKCOLOR
  END FUNCTION
END INTERFACE
```

### Description

GETBKCOLOR returns the current background color index for both text and graphics, as set with SETBKCOLOR. The color index of text over the background color is set with SETTEXTCOLOR and returned with GETTEXTCOLOR. The color index of graphics over the background color is set with SETCOLOR and returned with GETCOLOR. These non-RGB color functions use color indexes, not true color values, and limit the user to colors in the palette, at most 256. For access to all system colors, use SETBKCOLORRRGB, SETCOLORRRGB, and SETTEXTCOLORRRGB.

Generally, INTEGER ( 4 ) color arguments refer to color values and INTEGER ( 2 ) color arguments refer to color indexes. The two exceptions are GETBKCOLOR and SETBKCOLOR. The default background index is 0, which is associated with black unless the user remaps the palette with REMAPPALETTERGB.

### Output

The result type is INTEGER ( 4 ). The result is the current background color index.

---

## GETCOLOR

*Gets the current graphics color index.*

---

### Prototype

```
INTERFACE
  FUNCTION GETCOLOR ( )
    INTEGER ( 2 ) GETCOLOR
  END FUNCTION
END INTERFACE
```

### Description

GETCOLOR returns the current color index used for graphics over the background color as set with SETCOLOR. The background color index is set with SETBKCOLOR and returned with GETBKCOLOR. The color index of text over the background color is set with SETTEXTCOLOR and returned with GETTEXTCOLOR. These non-RGB color functions use color indexes, not true color values, and limit the user to colors in the palette, at most 256. For access to all system colors, use SETCOLORRGB, SETBKCOLORRGB, and SETTEXTCOLORRGB.

### Output

The result type is INTEGER ( 2 ). The result is the current color index, if successful; otherwise, - 1.



---

## GETCURRENTPOSITION

*Get the coordinates of the current graphics position.*

---

### Prototype

```
INTERFACE
  SUBROUTINE GETCURRENTPOSITION(S)
    STRUCTURE /XYCOORD/
      INTEGER(2) XCOORD, YCOORD
    END STRUCTURE
    RECORD /XYCOORD/ S
  END SUBROUTINE
END INTERFACE
```

T                      Output. Derived type xycoord. Viewport coordinates of current graphics position. The derived type XYCOORD is defined as follows:

```
TYPE XYCOORD
  INTEGER(2) XCOORD   ! x-coordinate
  INTEGER(2) YCOORD   ! y-coordinate
END TYPE XYCOORD
```

### Description

LINETO, MOVETO, and OUTGTEXT all change the current graphics position. It is in the center of the screen when a window is created.

Graphics output starts at the current graphics position returned by GETCURRENTPOSITION. This position is not related to normal text output (from OUTTEXT or WRITE, for example), which begins at the current text position (see SETTEXTPOSITION). It does, however, affect graphics text output from OUTGTEXT.

---

## GETCURRENTPOSITION\_W

*Get the coordinates of the current graphics position.*

---

### Prototype

```
INTERFACE
  SUBROUTINE GETCURRENTPOSITION_W(S)
    STRUCTURE /WXYCOORD/
      DOUBLE PRECISION WX, YX
    END STRUCTURE
    RECORD /WXYCOORD/ s
  END SUBROUTINE
END INTERFACE
```

WT                      Output. Derived type WXYCOORD. Window coordinates of current graphics position. The derived type wxycord is defined as follows:

```
TYPE WXYCOORD
  REAL(8) WX        ! x-coordinate
  REAL(8) WY        ! y-coordinate
END TYPE WXYCOORD
```

### Description

LINETO, MOVETO, and OUTGTEXT all change the current graphics position. It is in the center of the screen when a window is created.

Graphics output starts at the current graphics position returned by GETCURRENTPOSITION\_W. This position is not related to normal text output (from OUTTEXT or WRITE, for example), which begins at the current text position (see SETTEXTPOSITION). It does, however, affect graphics text output from OUTGTEXT.

---

## GETFILLMASK

*Returns the current pattern used to fill shapes.*

---

### Prototype

```
INTERFACE
  SUBROUTINE GETFILL(MASK)
    INTEGER(1) MASK(8)
  END SUBROUTINE
END INTERFACE
```

**MASK**                      Output. `INTEGER(1)`. One-dimensional array of length 8.

### Description

There are 8 bytes in `MASK`, and each of the 8 bits in each byte represents a pixel, creating an 8x8 pattern. The first element (byte) of `MASK` becomes the top 8 bits of the pattern, and the eighth element (byte) of `MASK` becomes the bottom 8 bits.

During a fill operation, pixels with a bit value of 1 are set to the current graphics color, while pixels with a bit value of 0 are unchanged. The current graphics color is set with `SETCOLORRGB` or `SETCOLOR`. The 8-byte mask is replicated over the entire fill area. If no fill mask is set (with `SETFILLMASK`), or if the mask is all ones, solid current color is used in fill operations.

The fill mask controls the fill pattern for graphics routines (`FLOODFILLRGB`, `PIE`, `ELLIPSE`, `POLYGON`, and `RECTANGLE`).

---

## GETIMAGE

*Stores the screen image defined by a specified bounding rectangle.*

---

### Prototype

```
INTERFACE
  SUBROUTINE GETIMAGE(X1,Y1,X2,Y2,IMAGE)
    INTEGER(2) X1,Y1,X2,Y2
    INTEGER(1) IMAGE(*)
  END SUBROUTINE
END INTERFACE
```

X1, Y1	Input. INTEGER(2). Viewport coordinates for upper-left corner of bounding rectangle.
X2, Y2	Input. INTEGER(2). Viewport coordinates for lower-right corner of bounding rectangle.
IMAGE	Output. INTEGER(1). Array of single-byte integers. Stored image buffer.

### Description

GETIMAGE defines the bounding rectangle in viewport-coordinate points (X1, Y1) and (X2, Y2).

The buffer used to store the image must be large enough to hold it. You can determine the image size by calling IMAGESIZE at run time, or by using the formula described under IMAGESIZE. After you have determined the image size, you can dimension the buffer accordingly.

---

## GETIMAGE\_W

*Stores the screen image defined by a specified bounding rectangle.*

---

### Prototype

```
INTERFACE
  SUBROUTINE GETIMAGE_W(WX1,WY1,WX2,WY2,IMAGE)
    double precision WX1,WY1,WX2,WY2
    INTEGER(1) IMAGE(*)
!MS$ ATTRIBUTES REFERENCE :: IMAGE
  END SUBROUTINE
END INTERFACE

WX1, WY1      Input. REAL(8). Window coordinates for upper-left
               corner of bounding rectangle.

WX2, WY2      Input. REAL(8). Window coordinates for lower-right
               corner of bounding rectangle.

IMAGE         Output. INTEGER(1). Array of single-byte integers.
               Stored image buffer.
```

### Description

GETIMAGE\_W defines the bounding rectangle in window-coordinate points (WX1, WY1) and (WX2, WY2).

The buffer used to store the image must be large enough to hold it. You can determine the image size by calling IMAGESIZE at run time, or by using the formula described under IMAGESIZE. After you have determined the image size, you can dimension the buffer accordingly.

---

## GETLINESTYLE

*Returns the current graphics line style.*

---

### Prototype

```
INTERFACE
  FUNCTION GETLINESTYLE ( )
    INTEGER ( 2 ) GETLINESTYLE
  END FUNCTION
END INTERFACE
```

### Description

GETLINESTYLE retrieves the mask (line style) used for line drawing. The mask is a 16-bit number, where each bit represents a pixel in the line being drawn.

If a bit is 1, the corresponding pixel is colored according to the current graphics color and logical write mode; if a bit is 0, the corresponding pixel is left unchanged. The mask is repeated for the entire length of the line. The default mask is #FFFF (a solid line). A dashed line can be represented by #FF00 (long dashes) or #F0F0 (short dashes).

The line style is set with SETLINESTYLE. The current graphics color is set with SETCOLORRGB or SETCOLOR. SETWRITEMODE affects how the line is displayed.

The line style retrieved by GETLINESTYLE affects the drawing of straight lines as in LINETO, POLYGON and RECTANGLE, but not the drawing of curved lines as in ARC, ELLIPSE or PIE.

### Output

The result type is INTEGER ( 2 ). The result is the current line style.

---

## GETPHYSCOORD

*Translates viewport coordinates to physical coordinates.*

---

### Prototype

```
INTERFACE
  SUBROUTINE GETPHYSCOORD(X,Y,S)
    INTEGER(2) X, Y
    STRUCTURE /XYCOORD/
      INTEGER(2) XCOORD, YCOORD
    END STRUCTURE
    RECORD /XYCOORD/ S
  END SUBROUTINE
END INTERFACE
```

X, Y            Input. INTEGER(2). Viewport coordinates to be translated to physical coordinates.

S               Output. Derived Type XYCOORD. Physical coordinates of the input viewport position.

```
TYPE xycoord
  INTEGER(2) XCOORD    ! x-coordinate
  INTEGER(2) YCOORD    ! y-coordinate
END TYPE XYCOORD
```

### Description

Physical coordinates refer to the physical screen. Viewport coordinates refer to an area of the screen defined as the viewport with SETVIEWPORT. Both take integer coordinate values. Window coordinates refer to a window sized with SETWINDOW or SETWSIZEQQ. Window coordinates are floating-point values and allow easy scaling of data to the window area.

---

## GETPIXEL

*Returns the color index of the pixel at a specified location.*

---

### Prototype

```
INTERFACE
  FUNCTION GETPIXEL(X,Y)
    INTEGER(2) GETPIXEL,X,Y
  END FUNCTION
END INTERFACE
```

X, Y                      Input. INTEGER(2). Viewport coordinates for pixel position.

### Description

Color routines without the RGB suffix, such as GETPIXEL, use color indexes, not true color values, and limit you to colors in the palette, at most 256. To access all system colors, use SETPIXELRGB to specify an explicit Red-Green-Blue value and retrieve the value with GETPIXELRGB.

### Output

The result type is INTEGER(2). The result is the pixel color index if successful; otherwise, -1 (if the pixel lies outside the clipping region, for example).



---

## GETPIXEL\_W

*Returns the color index of the pixel at a specified location.*

---

### Prototype

```
INTERFACE
  FUNCTION GETPIXEL_W(WX,WY)
    INTEGER(2) GETPIXEL_W
    DOUBLE PRECISION WX,WY
  END FUNCTION
END INTERFACE
```

WX, WY            Input. REAL( 8 ). Window coordinates for pixel position.

### Description

Color routines without the RGB suffix, such as GETPIXEL\_W, use color indexes, not true color values, and limit you to colors in the palette, at most 256. To access all system colors, use SETPIXELRGB to specify an explicit Red-Green-Blue value and retrieve the value with GETPIXELRGB.

### Output

The result type is INTEGER( 2 ). The result is the pixel color index if successful; otherwise, -1 (if the pixel lies outside the clipping region, for example).

---

## GETPIXELS

*Gets the color indexes of multiple pixels.*

---

### Prototype

```
INTERFACE
  SUBROUTINE GETPIXELS(N, X, Y, C)
    INTEGER(4) N      ! input : size of arrays
    INTEGER(2) X(*)    ! input : x coordinates
    INTEGER(2) Y(*)    ! input : y coordinates
    INTEGER(2) C(*)    ! input : palette indices
  END SUBROUTINE
END INTERFACE
```

N	Input. INTEGER( 4 ). Number of pixels to get. Sets the number of elements in the other arguments.
X, Y	Input. INTEGER( 2 ). Parallel arrays containing viewport coordinates of pixels to get.
C	Output. INTEGER( 2 ). Array to be filled with the color indexes of the pixels at <i>x</i> and <i>y</i> .

### Description

GETPIXELS fills in the array COLOR with color indexes of the pixels specified by the two input arrays X and Y. These arrays are parallel: the first element in each of the three arrays refers to a single pixel, the second element refers to the next pixel, and so on.

If the pixel is outside the clipping region, the value placed in the *color* array is undefined. Calls to GETPIXELS with N less than 1 are ignored.

GETPIXELS is a much faster way to acquire multiple pixel color indexes than individual calls to GETPIXEL.

The range of possible pixel color index values is determined by the current video mode and palette, at most 256 colors. To access all system colors you need to specify an explicit Red-Green-Blue (RGB) value with an RGB color function such as `SETPIXELSRGB` and retrieve the value with `GETPIXELSRGB`, rather than a palette index with a non-RGB color function.

---

## GETTEXTCOLOR

*Gets the current text color index.*

---

### Prototype

```
INTERFACE
    FUNCTION GETTEXTCOLOR ( )
        INTEGER ( 2 ) GETTEXTCOLOR
    END FUNCTION
END INTERFACE
```

### Description

`GETTEXTCOLOR` returns the text color index set by `SETTEXTCOLOR`. `SETTEXTCOLOR` affects text output with `OUTTEXT`, `WRITE`, and `PRINT`. The background color index is set with `SETBKCOLOR` and returned with `GETBKCOLOR`. The color index of graphics over the background color is set with `SETCOLOR` and returned with `GETCOLOR`. These non-RGB color functions use color indexes, not true color values, and limit the user to colors in the palette, at most 256. To access all system colors, use `SETTEXTCOLORRGB`, `SETBKCOLORRGB`, and `SETCOLORRGB`.

The default text color index is 15, which is associated with white unless the user remaps the palette.

### Output

The result type is `INTEGER ( 2 )`. It is the current text color index.

---

## GETTEXTPOSITION

*Returns the current text position.*

---

### Prototype

```
INTERFACE
  SUBROUTINE GETTEXTPOSITION(S)
    STRUCTURE /RCCOORD/
      INTEGER(2) ROW, COL
    END STRUCTURE
    RECORD /RCCOORD/ S
  END SUBROUTINE
END INTERFACE
```

*s*                      Output. Derived type RCCOORD. Current text position.

```
TYPE RCCOORD
  INTEGER(2) ROW    ! Row coordinate
  INTEGER(2) COL    ! Column coordinate
END TYPE RCCOORD
```

### Description

The text position given by coordinates (1, 1) is defined as the upper-left corner of the text window. Text output from the OUTTEXT function (and WRITE and PRINT statements) begins at the current text position. Font text is not affected by the current text position. Graphics output, including OUTGTEXT output, begins at the current graphics output position, which is a separate position returned by GETCURRENTPOSITION.

---

## GETTEXTWINDOW

*Finds the boundaries of the current text window.*

---

### Prototype

```
INTERFACE
  SUBROUTINE gettextwindow(R1,C1,R2,C2)
    INTEGER(2) R1,C1,R2,C2
  END SUBROUTINE
END INTERFACE
```

R1, C1	Output. INTEGER(2). Row and column coordinates for upper-left corner of the text window.
R2, C2	Output. INTEGER(2). Row and column coordinates for lower-right corner of the text window.

### Description

Output from OUTTEXT and WRITE is limited to the text window. By default, this is the entire window, unless the text window is redefined by SETTEXTWINDOW.

The window defined by SETTEXTWINDOW has no effect on output from OUTGTEXT.

---

## GETVIEWCOORD

*Translates physical coordinates or window coordinates to viewport coordinates.*

---

### Prototype

```

INTERFACE GETVIEWCOORD
  SUBROUTINE GETVIEWCOORD(X,Y,S)
    INTEGER(2) X, Y
    STRUCTURE /XYCOORD/
      INTEGER(2) XCOORD, YCOORD
    END STRUCTURE
    RECORD /XYCOORD/ S
  END SUBROUTINE
END INTERFACE

```

X, Y            Input. INTEGER(2). Physical coordinates to be converted to viewport coordinates.

S               Output. Derived type xycoord. Viewport coordinates.

```

TYPE XYCOORD
  INTEGER(2) XCOORD    ! x-coordinate
  INTEGER(2) YCOORD    ! y-coordinate
END TYPE XYCOORD

```

### Description

Viewport coordinates refer to an area of the screen defined as the viewport with SETVIEWPORT. Physical coordinates refer to the whole screen. Both take integer coordinate values. Window coordinates refer to a window sized with SETWINDOW or SETWSIZEQQ. Window coordinates are floating-point values and allow easy scaling of data to the window area.

---

## GETVIEWCOORD\_W

*Translates physical coordinates or window coordinates to viewport coordinates.*

---

### Prototype

```
INTERFACE
  SUBROUTINE GETVIEWCOORD_W(WX,WY,S)
    DOUBLE PRECISION WX,WY
    STRUCTURE /XYCOORD/
      INTEGER(2) XCOORD, YCOORD
    END STRUCTURE
    RECORD /XYCOORD/ S
  END SUBROUTINE
END INTERFACE
```

WX, WY      Input. REAL(8). Window coordinates to be converted to viewport coordinates.

S            Output. Derived type xycoord. Viewport coordinates.

```
TYPE XYCOORD
  INTEGER(2) XCOORD    ! x-coordinate
  INTEGER(2) ycYCOORDoord    ! y-coordinate
END TYPE XYCOORD
```

### Description

Viewport coordinates refer to an area of the screen defined as the viewport with SETVIEWPORT. Physical coordinates refer to the whole screen. Both take integer coordinate values. Window coordinates refer to a window sized with SETWINDOW or SETWSIZEQQ. Window coordinates are floating-point values and allow easy scaling of data to the window area.

---

## GETWINDOWCOORD

*Translates viewport coordinates to window coordinates.*

---

### Prototype

```

INTERFACE GETWINDOWCOORD
  SUBROUTINE GETWINDOWCOORD(X,Y,S)
    INTEGER(2) X, Y
    STRUCTURE /XYCOORD/
      DOUBLE PRECISION X, Y
    END STRUCTURE
    RECORD /wxycord/ s
  END SUBROUTINE
END INTERFACE

```

**X, Y**                      Input. INTEGER(2). Viewport coordinates to be converted to window coordinates.

**WT**                        Output. Derived type XYCOORD. Window coordinates.

```

TYPE XYCOORD
  REAL(8) X    ! x-coordinate
  REAL(8) Y    ! y-coordinate
END TYPE XYCOORD

```

### Description

Physical coordinates refer to the physical screen. Viewport coordinates refer to an area of the screen defined as the viewport with SETVIEWPORT. Both take integer coordinate values. Window coordinates refer to a window sized with SETWINDOW or SETWSIZEQQ. Window coordinates are floating-point values and allow easy scaling of data to the window area.



---

## GETWRITEMODE

*Returns the current logical write mode.*

---

### Prototype

```
INTERFACE
    FUNCTION GETWRITEMODE ( )
        INTEGER ( 2 ) GETWRITEMODE
    END FUNCTION
END INTERFACE
```

### Description

Returns the current logical write mode, which is used when drawing lines with the `LINE`, `POLYGON`, and `RECTANGLE` functions. The write mode is set with `SETWRITEMODE`.

### Output

The result type is `INTEGER ( 2 )`. The result is the current write mode. The default value is `$GPSET`. Possible return values are:

<code>\$GPSET</code>	Causes lines to be drawn in the current graphics color. (default)
<code>\$GAND</code>	Causes lines to be drawn in the color that is the logical AND of the current graphics color and the current background color.
<code>\$GOR</code>	Causes lines to be drawn in the color that is the logical OR of the current graphics color and the current background color.
<code>\$GPRESET</code>	Causes lines to be drawn in the color that is the logical NOT of the current graphics color.
<code>\$GXOR</code>	Causes lines to be drawn in the color that is the logical exclusive OR (XOR) of the current graphics color and the current background color.

---

## GRSTATUS

*Returns the status of the most recently used graphics routine.*

---

### Prototype

```
INTERFACE
  FUNCTION GRSTATUS ( )
    integer*2 GRSTATUS
  END FUNCTION
END INTERFACE
```

### Description

Use GRSTATUS immediately following a call to a graphics routine to determine if errors or warnings were generated. Return values less than 0 are errors, and values greater than 0 are warnings.

\$GRFILEWRITEERROR	Error writing bitmap file
\$GRFILEOPENERERROR	Error opening bitmap file
\$GRIMAGEREADERERROR	Error reading image
\$GRBITMAPDISPLAYERROR	Error displaying bitmap
\$GRBITMAPTOOLARGE	Bitmap too large
\$GRIMPROPERBITMAPFORMAT	Improper format for bitmap file
\$GRFILEREADERERROR	Error reading file
\$GRNOBITMAPFILE	No bitmap file
\$GRINVALIDIMAGEBUFFER	Image buffer data inconsistent
\$GRINSUFFICIENTMEMORY	Not enough memory to allocate buffer or to complete a fill operation
\$GRINVALIDPARAMETER	One or more parameters invalid
\$GRMODENOTSUPPORTED	Requested video mode not supported
\$GRRERROR	Graphics error

\$GROK	Success
\$GRNOOUTPUT	No action taken
\$GRCLIPPED	Output was clipped to viewport
\$GRPARAMETERALTERED	One or more input parameters was altered to be within range, or pairs of parameters were interchanged to be in the proper order

After a graphics call, compare the return value of GRSTATUS to \$GROK to determine if an error has occurred.

### Output

The result type is INTEGER ( 2 ). The result is the status of the most recently used graphics function.

---

## IMAGESIZE

*Returns the number of bytes needed to store the image inside the specified bounding rectangle.*

---

### Prototype

```
INTERFACE
  FUNCTION IMAGESIZE ( X1 , Y1 , X2 , Y2 )
    INTEGER ( 4 ) IMAGESIZE
    INTEGER ( 2 ) X1 , Y1 , X2 , Y2
  END FUNCTION
END INTERFACE
```

X1 , Y1      Input. INTEGER ( 2 ). Viewport coordinates for upper-left corner of image.

X2 , Y2      Input. INTEGER ( 2 ). Viewport coordinates for lower-right corner of image.

**Description**

IMAGESIZE defines the bounding rectangle in viewport-coordinate points (X1, Y1) and (X2, Y2). Returns the number of bytes needed to store the image inside the specified bounding rectangle. Useful for determining how much memory is needed for a call to GETIMAGE.

**Output**

The result type is INTEGER(4). The result is the storage size of an image in bytes.

---

**IMAGESIZE\_W**

*Returns the number of bytes needed to store the image inside the specified bounding rectangle.*

---

**Prototype**

```
INTERFACE
  FUNCTION IMAGESIZE_W(WX1,WY1,WX2,WY2)
    INTEGER(4) IMAGESIZE_W
    DOUBLE PRECISION WX1,WY1,WX2,WY2
  END FUNCTION
END INTERFACE
```

WX1, WY1      Input. REAL(8). Window coordinates for upper-left corner of image.

WX2, WY2      Input. REAL(8). Window coordinates for lower-right corner of image.

**Description**

IMAGESIZE\_W defines the bounding rectangle in terms of window-coordinate points (WX1, WY1) and (WX2, WY2).

The function returns the number of bytes needed to store the image inside the specified bounding rectangle. `IMAGESIZE` is useful for determining how much memory is needed for a call to `GETIMAGE`.

### Output

The result type is `INTEGER ( 4 )`. The result is the storage size of an image in bytes.

---

## LINETO

*Draws a line from the current graphics position up to and including the end point.*

---

### Prototype

```
INTERFACE
  FUNCTION LINETO (X, Y)
    INTEGER ( 2 ) LINETO, X, Y
  END FUNCTION
END INTERFACE
```

`X, Y`                      Input. `INTEGER ( 2 )`. Viewport coordinates of end point.

### Description

The line is drawn using the current graphics color, logical write mode, and line style. The graphics color is set with `SETCOLORRGB`, the write mode with `SETWRITEMODE`, and the line style with `SETLINESTYLE`.

If no error occurs, `LINETO` sets the current graphics position to the viewport point (`X, Y`).

If you use `FLOODFILLRGB` to fill in a closed figure drawn with `LINETO`, the figure must be drawn with a solid line style. Line style is solid by default and can be changed with `SETLINESTYLE`.

## Output

The result type is `INTEGER ( 2 )`. The result is a nonzero value if successful; otherwise, 0.

---

## LINETO\_W

*Draws a line from the current graphics position up to and including the end point.*

---

## Prototype

```
INTERFACE
  FUNCTION LINETO_W(WX,WY)
    INTEGER( 2 ) LINETO_W
    dDOUBLE PRECISION WX,WY
  END FUNCTION
END INTERFACE
```

`WX, WY`      Input. `REAL ( 8 )`. Window coordinates of end point.

## Description

The line is drawn using the current graphics color, logical write mode, and line style. The graphics color is set with `SETCOLORRGB`, the write mode with `SETWRITEMODE`, and the line style with `SETLINESTYLE`.

If no error occurs, `LINETO_W` sets the current graphics position to the window point (`WX, WY`).

If you use `FLOODFILLRGB` to fill in a closed figure drawn with `LINETO_W`, the figure must be drawn with a solid line style. Line style is solid by default and can be changed with `SETLINESTYLE`.

## Output

The result type is `INTEGER ( 2 )`. The result is a nonzero value if successful; otherwise, 0.

---

## LOADIMAGE

*Reads an image from a Windows bitmap file and displays it at a specified location.*

---

### Prototype

```
INTERFACE
  FUNCTION LOADIMAGE ( FNAME , X , Y )
    INTEGER ( 4 ) LOADIMAGE , X , Y
    CHARACTER ( LEN = * ) FNAME
  END FUNCTION
END INTERFACE
```

FNAME	Input. CHARACTER ( LEN = * ). Path of the bitmap file.
X , Y	Input. INTEGER ( 4 ). Viewport coordinates for upper-left corner of image display.

### Description

The image is displayed with the colors in the bitmap file. If the color palette in the bitmap file is different from the current system palette, the current palette is discarded and the bitmap's palette is loaded.

LOADIMAGE specifies the screen placement of the image in viewport coordinates.

### Output

The result type is INTEGER ( 4 ). The result is zero if successful; otherwise, a negative value.

---

## LOADIMAGE\_W

*Reads an image from a Windows bitmap file and displays it at a specified location.*

---

### Prototype

```
INTERFACE
  FUNCTION LOADIMAGE_W(FNAME, WX, WY)
    INTEGER(4) LOADIMAGE_W
    CHARACTER(LEN=*) FNAME
    DOUBLE PRECISION WX, WY
  END FUNCTION
END INTERFACE
```

FNAME	Input. CHARACTER(LEN=*) . Path of the bitmap file.
WX , WY	Input. REAL(8) . Window coordinates for upper-left corner of image display.

### Description

The image is displayed with the colors in the bitmap file. If the color palette in the bitmap file is different from the current system palette, the current palette is discarded and the bitmap's palette is loaded.

LOADIMAGE\_W specifies the screen placement of the image in window coordinates.

### Output

The result type is INTEGER(4) . The result is zero if successful; otherwise, a negative value.



---

## MOVETO

*Moves the current graphics position to a specified point. No drawing occurs.*

---

### Prototype

```
INTERFACE MOVETO
  SUBROUTINE MOVETO(X,Y,S)
    INTEGER(2) X, Y
    integer*2 y
    STRUCTURE /XYCOORD/
      INTEGER(2) XCOORD, YCOORD
    END STRUCTURE
    RECORD /XYCOORD/S
  END SUBROUTINE
END INTERFACE
```

X, Y            Input. INTEGER(2). Viewport coordinates of the new graphics position.

S               Output. Derived type XYCOORD. Viewport coordinates of the previous graphics position.

```
TYPE XYCOORD
  INTEGER(2) XCOORD ! x coordinate
  INTEGER(2) YCOORD ! y coordinate
END TYPE XYCOORD
```

### Description

MOVETO sets the current graphics position to the viewport coordinate (X, Y). It assigns the coordinates of the previous position to S respectively.

---

## MOVETO\_W

*Moves the current graphics position to a specified point. No drawing occurs.*

---

### Prototype

```

INTERFACE
  SUBROUTINE MOVETO_W(WX,WY,S)
    DOUBLE PRECISION WX,WY
    STRUCTURE /WXYCOORD/
      DOUBLE PRECISION WX, WY
    END STRUCTURE
    RECORD /WXYCOORD/s
  END SUBROUTINE
END INTERFACE

```

**WX,WY**            Input. REAL( 8 ). Window coordinates of the new graphics position.

**S**                Output. Derived type WXYCOORD. Window coordinates of the previous graphics position.

```

TYPE WXYCOORD
  REAL(8) WX  ! x window coordinate
  REAL(8) WY  ! y window coordinate
END TYPE WXYCOORD

```

### Description

MOVETO\_W sets the current graphics position to the window coordinates (WX, WY). Next call to MOVETO\_W assigns the coordinates of the previous position to S, respectively.

---

## OUTTEXT

*In text or graphics mode, sends a string of text to the screen, including any trailing blanks.*

---

### Prototype

```
INTERFACE
  SUBROUTINE OUTTEXT(TEXT)
    CHARACTER(LEN=*) TEXT
  END SUBROUTINE
END INTERFACE
```

TEXT            Input. CHARACTER(LEN=\*) . String to be displayed.

### Description

Text output begins at the current text position in the color set with SETTEXTCOLORRGB or SETTEXTCOLOR. No formatting is provided. After it outputs the text, OUTTEXT updates the current text position.

---

## PIE

*Draws a pie-shaped wedge in the current graphics color.*

---

### Prototype

```
INTERFACE
  FUNCTION PIE(I,X1,Y1,X2,Y2,X3,Y3,X4,Y4)
    INTEGER(2) PIE,I,X1,Y1,X2,Y2,X3,Y3,X4,Y4
  END FUNCTION
END INTERFACE
```

I	Input. <code>INTEGER ( 2 )</code> . Fill flag. One of the following symbolic constants:  <code>\$GFILLINTERIOR</code> Fills the figure using the current color and fill mask.  <code>\$GBORDER</code> Does not fill the figure.
X1 , Y1	Input. <code>INTEGER ( 2 )</code> . Viewport coordinates for upper-left corner of bounding rectangle.
X2 , Y2	Input. <code>INTEGER ( 2 )</code> . Viewport coordinates for lower-right corner of bounding rectangle.
X3 , Y3	Input. <code>INTEGER ( 2 )</code> . Viewport coordinates of start vector.
X4 , Y4	Input. <code>INTEGER ( 2 )</code> . Viewport coordinates of end vector.

### Description

The border of the pie wedge is drawn in the current color set by `SETCOLORRGB`.

The `PIE` function uses the viewport-coordinate system. The center of the arc is the center of the bounding rectangle, which is specified by the viewport-coordinate points (X1 , Y1) and (X2 , Y2). The arc starts where it intersects an imaginary line extending from the center of the arc through (X3 , Y3). It is drawn counterclockwise about the center of the arc, ending where it intersects an imaginary line extending from the center of the arc through (X4 , Y4).

The fill flag option `$GFILLINTERIOR` is equivalent to a subsequent call to `FLOODFILLRGB` using the center of the pie as the starting point and the current graphics color (set by `SETCOLORRGB`) as the fill color. If you want a fill color different from the boundary color, you cannot use the `$GFILLINTERIOR` option. Instead, after you have drawn the pie wedge, change the current color with `SETCOLORRGB` and then call `FLOODFILLRGB`. You must supply `FLOODFILLRGB` with an interior point in the figure you want to fill. You can get this point for the last drawn pie or arc by calling `GETARCINFO`.

If you fill the pie with `FLOODFILLRGB`, the pie must be bordered by a solid line style. Line style is solid by default and can be changed with `SETLINESTYLE`.

## Output

The result type is `INTEGER(2)`. The result is nonzero if successful; otherwise, 0. If the pie is clipped or partially out of bounds, the pie is considered successfully drawn and the return is 1. If the pie is drawn completely out of bounds, the return is 0.

---

## PIE\_W

*Draws a pie-shaped wedge in the current graphics color.*

---

## Prototype

```
INTERFACE
  FUNCTION PIE_W(I, WX1, WY1, WX2, WY2, WX3, WY3, WX4, WY4)
    INTEGER(2) PIE_W, I
    DOUBLE PRECISION WX1, WY1, WX2, WY2, WX3, WY3, WX4, WY4
  END FUNCTION
END INTERFACE
```

I	Input. <code>INTEGER(2)</code> . Fill flag. One of the following symbolic constants:  <code>\$GFILLINTERIOR</code> Fills the figure using the current color and fill mask.  <code>\$GBORDER</code> Does not fill the figure.
WX1, WY1	Input. <code>REAL(8)</code> . Window coordinates for upper-left corner of bounding rectangle.
WX2, WY2	Input. <code>REAL(8)</code> . Window coordinates for lower-right corner of bounding rectangle.

WX3 , WY3            Input. REAL ( 8 ) . Window coordinates of start vector.

WX4 , WY4            Input. REAL ( 8 ) . Window coordinates of end vector.

### Description

The border of the pie wedge is drawn in the current color set by SETCOLORRGB.

The PIE\_W function uses the window-coordinate system. The center of the arc is the center of the bounding rectangle specified by the window-coordinate points (WX1 , WY1) and (WX2 , WY2). The arc starts where it intersects an imaginary line extending from the center of the arc through (WX3 , WY3). It is drawn counterclockwise about the center of the arc, ending where it intersects an imaginary line extending from the center of the arc through (WX4 , WY4).

The fill flag option \$GFILLINTERIOR is equivalent to a subsequent call to FLOODFILLRGB using the center of the pie as the starting point and the current graphics color (set by SETCOLORRGB) as the fill color. If you want a fill color different from the boundary color, you cannot use the \$GFILLINTERIOR option. Instead, after you have drawn the pie wedge, change the current color with SETCOLORRGB and then call FLOODFILLRGB. You must supply FLOODFILLRGB with an interior point in the figure you want to fill. You can get this point for the last drawn pie or arc by calling GETARCINFO.

If you fill the pie with FLOODFILLRGB, the pie must be bordered by a solid line style. Line style is solid by default and can be changed with SETLINESTYLE.

### Output

The result type is INTEGER ( 2 ) . The result is nonzero if successful; otherwise, 0. If the pie is clipped or partially out of bounds, the pie is considered successfully drawn and the return is 1. If the pie is drawn completely out of bounds, the return is 0.

---

## POLYGON

*Draws a polygon using the current graphics color, logical write mode, and line style.*

---

### Prototype

```
INTERFACE
  FUNCTION POLYGON( CONTROL, LPPOINTS, CPOINTS )
    INTEGER( 2 ) POLYGON, CONTROL, CPOINTS
    STRUCTURE /XYCOORD/
      INTEGER( 2 ) XCOORD
      INTEGER( 2 ) YCOORD
    END STRUCTURE
    RECORD /XYCOORD/LPPOINTS( * )
  END FUNCTION
END INTERFACE
```

CONTROL      Input. INTEGER( 2 ). Fill flag. One of the following symbolic constants:

- \$GFILLINTERIOR      Fills the figure using the current color and fill mask.
- \$GBORDER      Does not fill the figure.

LPPOINTS      Input. Derived type XYCOORD. Array of derived types defining the polygon vertices in viewport coordinates.

```
  TYPE XYCOORD
    INTEGER( 2 ) XCOORD
    INTEGER( 2 ) YCOORD
  END TYPE XYCOORD
```

CPOINTS      Input. INTEGER( 2 ). Number of polygon vertices.

## Description

The border of the polygon is drawn in the current graphics color, logical write mode, and line style, set with `SETCOLORRRGB`, `SETWRITEMODE`, and `SETLINESTYLE`, respectively. The `POLYGON` routine uses the viewport-coordinate system (expressed in `xycoord` derived types).

The arguments `LPPOINTS` are arrays whose elements are `XYCOORD` or `WXYCOORD` derived types. Each element specifies one of the polygon's vertices. The argument `CPOINTS` is the number of elements (the number of vertices) in the `LPPOINTS` array.

Note that `POLYGON` draws between the vertices in their order in the array. Therefore, when drawing outlines, skeletal figures, or any other figure that is not filled, you need to be careful about the order of the vertices. If you don't want lines between some vertices, you may need to repeat vertices to make the drawing backtrack and go to another vertex to avoid drawing across your figure. Also, `POLYGON` draws a line from the last specified vertex back to the first vertex.

If you fill the polygon using `FLOODFILLRGB`, the polygon must be bordered by a solid line style. Line style is solid by default and can be changed with `SETLINESTYLE`.

## Output

The result type is `INTEGER( 2 )`. The result is nonzero if anything is drawn; otherwise, 0.



---

## POLYGON\_W

*Draws a polygon using the current graphics color, logical write mode, and line style.*

---

### Prototype

```
INTERFACE
  FUNCTION POLYGON_W( CONTROL, LPPOINTS, CPOINTS )
    INTEGER( 2 ) POLYGON_W, CONTROL, CPOINTS
    STRUCTURE /WXYCOORD/
      DOUBLE PRECISION WX, WY
    END STRUCTURE
    RECORD /WXYCOORD/LPPOINTS( * )
  END FUNCTION
END INTERFACE
```

CONTROL      Input. INTEGER( 2 ). Fill flag. One of the following symbolic constants:

                 \$GFILLINTERIOR   Fills the figure using the current color and fill mask.

                 \$GBORDER          Does not fill the figure.

LPPOINTS      Input. Derived type WXYCOORD. Array of derived types defining the polygon vertices in window coordinates.

```
      TYPE WXYCOORD
        REAL( W ) WX, WY
      END TYPE WXYCOORD
```

CPOINTS      Input. INTEGER( 2 ). Number of polygon vertices.

## Description

The border of the polygon is drawn in the current graphics color, logical write mode, and line style, set with `SETCOLORRRGB`, `SETWRITEMODE`, and `SETLINESTYLE`, respectively. The `POLYGON_W` routine uses real-valued window coordinates (expressed in `wxycoord` types).

The arguments `LPPOINTS` are arrays whose elements are `XYCOORD` or `WXYCOORD` derived types. Each element specifies one of the polygon's vertices. The argument `CPOINTS` is the number of elements (the number of vertices) in the `LPPOINTS` array.

Note that `POLYGON_W` draws between the vertices in their order in the array. Therefore, when drawing outlines, skeletal figures, or any other figure that is not filled, you need to be careful about the order of the vertices. If you don't want lines between some vertices, you may need to repeat vertices to make the drawing backtrack and go to another vertex to avoid drawing across your figure. Also, `POLYGON_W` draws a line from the last specified vertex back to the first vertex.

If you fill the polygon using `FLOODFILLRGB`, the polygon must be bordered by a solid line style. Line style is solid by default and can be changed with `SETLINESTYLE`.

## Output

The result type is `INTEGER( 2 )`. The result is nonzero if anything is drawn; otherwise, 0.

---

## PUTIMAGE

*Transfers the image stored in memory to the screen.*

---

### Prototype

```
INTERFACE
  SUBROUTINE PUTIMAGE ( X, Y, IMAGE, ACTION )
    INTEGER ( 2 ) X, Y, ACTION
    INTEGER ( 1 ) IMAGE ( * )
  END SUBROUTINE
END INTERFACE
```

X, Y	Input. INTEGER ( 2 ). Viewport coordinates for upper-left corner of the image when placed on the screen.
IMAGE	Input. INTEGER ( 1 ). Array of single-byte integers. Stored image buffer.
ACTION	Input. INTEGER ( 2 ). Interaction of the stored image with the existing screen image. One of the following symbolic constants:  \$GAND      Forms a new screen display as the logical AND of the stored image and the existing screen display. Points that have the same color in both the existing screen image and the stored image remain the same color, while points that have different colors are joined by a logical AND.  \$GOR      Superimposes the stored image onto the existing screen display. The resulting image is the logical OR of the image.

\$GPRESET	Transfers the data point-by-point onto the screen. Each point has the inverse of the color attribute it had when it was taken from the screen by GETIMAGE, producing a negative image.
\$GPSET	Transfers the data point-by-point onto the screen. Each point has the exact color attribute it had when it was taken from the screen by GETIMAGE.
\$GXOR	Causes points in the existing screen image to be inverted wherever a point exists in the stored image. This behavior is like that of a cursor. If you perform an exclusive OR of an image with the background twice, the background is restored unchanged. This allows you to move an object around without erasing the background. The \$GXOR constant is a special mode often used for animation.

In addition, the following ternary raster operation constants can be used (described in the online documentation for the WIN32 API BitBlt):

\$GSRCCOPY (same as \$GPSET)  
 \$GSRCPAINT (same as \$GOR)  
 \$GSRCAND (same as \$GAND)  
 \$GSRCINVERT (same as \$GXOR)  
 \$GSRCERASE  
 \$GNOTSRCCOPY (same as \$GPRESET)  
 \$GNOTSRCERASE  
 \$GMERGECOPY  
 \$GMERGEPAINT  
 \$GPATCOPY  
 \$GPATPAINT

\$GPATINVERT  
\$GDSTINVERT  
\$GBLACKNESS  
\$GWHITENESS

### Description

PUTIMAGE places the upper-left corner of the image at the viewport coordinates (X, Y).

---

## PUTIMAGE\_W

*Transfers the image stored in memory to the screen.*

---

### Prototype

```
INTERFACE
  SUBROUTINE PUTIMAGE_W(WX, WY, IMAGE, ACTION)
    DOUBLE PRECISION WX, WY
    INTEGER(1) IMAGE(*)
    !MS$ ATTRIBUTES REFERENCE :: IMAGE
    INTEGER(2) ACTION
  END SUBROUTINE
END INTERFACE
```

WX, WY	Input. REAL(8). REAL(8). Window coordinates for upper-left corner of the image when placed on the screen.
IMAGE	Input. INTEGER(1). Array of single-byte integers. Stored image buffer.
ACTION	Input. INTEGER(2). Interaction of the stored image with the existing screen image. One of the following symbolic constants:

<code>\$GAND</code>	Forms a new screen display as the logical AND of the stored image and the existing screen display. Points that have the same color in both the existing screen image and the stored image remain the same color, while points that have different colors are joined by a logical AND.
<code>\$GOR</code>	Superimposes the stored image onto the existing screen display. The resulting image is the logical OR of the image.
<code>\$GPRESET</code>	Transfers the data point-by-point onto the screen. Each point has the inverse of the color attribute it had when it was taken from the screen by <code>GETIMAGE_W</code> , producing a negative image.
<code>\$GPSET</code>	Transfers the data point-by-point onto the screen. Each point has the exact color attribute it had when it was taken from the screen by <code>GETIMAGE_W</code> .
<code>\$GXOR</code>	Causes points in the existing screen image to be inverted wherever a point exists in the stored image. This behavior is like that of a cursor. If you perform an exclusive OR of an image with the background twice, the background is restored unchanged. This allows you to move an object around without erasing the background. The <code>\$GXOR</code> constant is a special mode often used for animation.

In addition, the following ternary raster operation constants can be used (described in the online documentation for the WIN32 API `BitBlt`):

`$GSRCCOPY` (same as `$GPSET`)

`$GSRCPAINT` (same as `$GOR`)

`$GSRCAND` (same as `$GAND`)

```
$GSRXCINVERT (same as $GXOR)
$GSRXCERASE
$GNOTSRCCOPY (same as $GPRESET)
$GNOTSRCERASE
$GMERGECOPY
$GMERGEPAINT
$GPATCOPY
$GPATPAINT
$GPATINVERT
$GDSTINVERT
$GBLACKNESS
$GWHITENESS
```

### Description

PUTIMAGE\_W places the upper-left corner of the image at the window coordinates (WX, WY).

---

## RECTANGLE

*Draws a rectangle using the current graphics color, logical write mode, and line style.*

---

### Prototype

```
INTERFACE
FUNCTION RECTANGLE (CONTROL, X1, Y1, X2, Y2)
    INTEGER (2) RECTANGLE
    INTEGER (2) CONTROL, X1, Y1, X2, Y2
END FUNCTION
```

END INTERFACE	
CONTROL	Input. INTEGER ( 2 ). Fill flag. One of the following symbolic constants:
	\$GFILLINTERIOR Draws a solid figure using the current color and fill mask.
	\$GBORDER Draws the border of a rectangle using the current color and line style.
X1 , Y1	Input. INTEGER ( 2 ). Viewport coordinates for upper-left corner of rectangle.
X2 , Y2	Input. INTEGER ( 2 ). Viewport coordinates for lower-right corner of rectangle.

### Description

The RECTANGLE function uses the viewport-coordinate system. The viewport coordinates (X1 , Y1) and (X2 , Y2) are the diagonally opposed corners of the rectangle.

SETCOLORRGB sets the current graphics color. SETFILLMASK sets the current fill mask. By default, filled graphic shapes are filled solid with the current color.

If you fill the rectangle using FLOODFILLRGB, the rectangle must be bordered by a solid line style. Line style is solid by default and can be changed with SETLINESTYLE.

### Output

The result type is INTEGER ( 2 ). The result is nonzero if successful; otherwise, 0.



---

## RECTANGLE\_W

*Draws a rectangle using the current graphics color, logical write mode, and line style.*

---

### Prototype

```
INTERFACE
  FUNCTION RECTANGLE_W( CONTROL, WX1, WY1, WX2, WY2 )
    INTEGER( 2 ) RECTANGLE_W, CONTROL
    DOUBLE PRECISION WX1, WY1, WX2, WY2
  END FUNCTION
END INTERFACE
```

CONTROL	Input. INTEGER( 2 ). Fill flag. One of the following symbolic constants:  \$GFILLINTERIOR    Draws a solid figure using the current color and fill mask.  \$GBORDER         Draws the border of a rectangle using the current color and line style.
WX1, WY1	Input. REAL( 8 ). Window coordinates for upper-left corner of rectangle.
WX2, WY2	Input. REAL( 8 ). Window coordinates for lower-right corner of rectangle.

### Description

The RECTANGLE\_W function uses the window-coordinate system. The window coordinates (WX1, WY1) and (WX2, WY2) are the diagonally opposed corners of the rectangle.

SETCOLORRGB sets the current graphics color. SETFILLMASK sets the current fill mask. By default, filled graphic shapes are filled solid with the current color.

If you fill the rectangle using `FLOODFILLRGB`, the rectangle must be bordered by a solid line style. Line style is solid by default and can be changed with `SETLINESTYLE`.

### Output

The result type is `INTEGER( 2 )`. The result is nonzero if successful; otherwise, 0.

---

## REMAPALLPALETTERGB

*Remaps a set of Red-Green-Blue (RGB) color values to indexes recognized by the video hardware.*

---

### Prototype

```
INTERFACE
  FUNCTION REMAPALLPALETTERGB (COLORS)
    INTEGER( 2 ) REMAPALLPALETTERGB
    INTEGER( 4 ) COLORS ( * )
  END FUNCTION
END INTERFACE
```

**COLORS**            Input. `INTEGER( 4 )`. Ordered array of RGB color values to be mapped in order to indexes. Must hold 0-255 elements.

### Description

The `REMAPALLPALETTERGB` function remaps all of the available color indexes simultaneously (up to 236; 20 indexes are reserved by the operating system). The `COLORS` argument points to an array of RGB color values. The default mapping between the first 16 indexes and color values is shown in the following table

Index	Color	Index	Color
0	\$BLACK	8	\$GRAY
1	\$BLUE	9	\$LIGHTBLUE
2	\$GREEN	10	\$LIGHTGREEN
3	\$CYAN	11	\$LIGHTCYAN
4	\$RED	12	\$LIGHTRED
5	\$MAGENTA	13	\$LIGHTMAGENTA
6	\$BROWN	14	\$YELLOW
7	\$WHITE	15	\$BRIGHTWHITE

The number of colors mapped can be fewer than 236 if the number of colors supported by the current video mode is fewer, but at most 236 colors can be mapped by `REMAPALLPALETTERGB`. Most Windows graphics drivers support a palette of 256K colors or more, of which only a few can be mapped into the 236 palette indexes at a time. To access and use all colors on the system, bypass the palette and use direct RGB color functions such as `SETCOLORRGB` and `SETPIXELSRGB`.

In each RGB color value, each of the three colors, red, green and blue, is represented by an eight-bit value (2 hex digits). In the values you specify with `REMAPALLPALETTERGB`, red is the rightmost byte, followed by green and blue. The RGB value's internal structure is as follows:

Larger numbers correspond to stronger color intensity with binary 11111111 (hex FF) the maximum for each of the three components. For example, #008080 yields full-intensity red, #00FF00 full-intensity green, #FF0000 full-intensity blue, and #FFFFFF full-intensity for all three, resulting in bright white.

## Output

The result type is `INTEGER ( 4 )`. `REMAPALLPALETTERGB` returns 0 if successful; otherwise, - 1.

# REMAPPALLETTERGB

*Remaps one color index to an RGB color value.*

---

## Prototype

```

INTERFACE
  FUNCTION REMAPPALLETTERGB ( INDEX , COLOR )
    INTEGER ( 4 ) REMAPPALLETTERGB , COLOR
    INTEGER ( 2 ) INDEX
  END FUNCTION
END INTERFACE

COLOR      Input. INTEGER ( 4 ) . RGB color value to assign to a
            color index.

INDEX      Input. INTEGER ( 2 ) . Color index to be reassigned an
            RGB color.
```

## Description

The REMAPPALLETTERGB function remaps one of the available color indexes (up to 236; 20 indexes are reserved by the operating system). The COLOR argument is the RGB color value to assign. The default mapping between the first 16 indexes and color values is shown in the following table..

Index	Color	Index	Color
0	\$BLACK	8	\$GRAY
1	\$BLUE	9	\$LIGHTBLUE
2	\$GREEN	10	\$LIGHTGREEN
3	\$CYAN	11	\$LIGHTCYAN
4	\$RED	12	\$LIGHTRED
5	\$MAGENTA	13	\$LIGHTMAGENTA

continued

Index	Color	Index	Color
6	\$BROWN	14	\$YELLOW
7	\$WHITE	15	\$BRIGHTWHITE

The number of colors mapped can be fewer than 236 if the number of colors supported by the current video mode is fewer, but at most 236 colors can be mapped by `REMAPPALETTERGB`. Most Windows graphics drivers support a palette of 256K colors or more, of which only a few can be mapped into the 236 palette indexes at a time. To access and use all colors on the system, bypass the palette and use direct RGB color functions such as `SETCOLORRGB` and `SETPIXELSRGB`.

In each RGB color value, each of the three colors, red, green and blue, is represented by an eight-bit value (2 hex digits). In the values you specify with `REMAPPALETTERGB`, red is the rightmost byte, followed by green and blue. The RGB value's internal structure is as follows:

Larger numbers correspond to stronger color intensity with binary 11111111 (hex FF) the maximum for each of the three components. For example, #008080 yields full-intensity red, #00FF00 full-intensity green, #FF0000 full-intensity blue, and #FFFFFF full-intensity for all three, resulting in bright white.

## Output

The result type is `INTEGER ( 4 )`. `REMAPPALETTERGB` returns the previous color assigned to the index.

---

## SAVEIMAGE

*Saves an image from a specified portion of the screen into a Windows bitmap file.*

---

### Prototype

```
INTERFACE
  INTEGER(4) FUNCTION SAVEIMAGE(FNAME,X1,Y1,X2,Y2)
    CHARACTER(LEN=*) FNAME
    INTEGER(4) X1,Y1,X2,Y2
  END FUNCTION
END INTERFACE
```

FNAME	Input. CHARACTER(LEN=*) . Path of the bitmap file.
X1,Y1	Input. INTEGER(4) . Viewport coordinates for upper-left corner of the screen image to be captured.
X2,Y2	Input. INTEGER(4) . Viewport coordinates for lower-right corner of the screen image to be captured.

### Description

The SAVEIMAGE function captures the screen image within a rectangle defined by the upper-left and lower-right screen coordinates and stores the image as a Windows bitmap file specified by FNAME. The image is stored with a palette containing the colors displayed on the screen.

SAVEIMAGE defines the bounding rectangle in viewport coordinates.

### Output

The result type is INTEGER(4) . The result is zero if successful; otherwise, a negative value.

---

## SAVEIMAGE\_W

*Saves an image from a specified portion of the screen into a Windows bitmap file.*

---

### Prototype

INTERFACE

```
INTEGER(4) FUNCTION SAVEIMAGE_W(FNAME, WX1, WY1,
                                WX2, WY2)
```

```
CHARACTER(LEN=*) FNAME
```

```
DOUBLE PRECISION WX1, WY1, WX2, WY2
```

```
END FUNCTION
```

```
END INTERFACE
```

FNAME            Input. CHARACTER(LEN=\*) . Path of the bitmap file.

WX1, WY1        Input. REAL(8) . Window coordinates for upper-left corner of the screen image to be captured.

WX2, WY2        Input. REAL(8) . Window coordinates for lower-right corner of the screen image to be captured.

### Description

The SAVEIMAGE\_W function captures the screen image within a rectangle defined by the upper-left and lower-right screen coordinates and stores the image as a Windows bitmap file specified by FNAME. The image is stored with a palette containing the colors displayed on the screen.

SAVEIMAGE\_W defines the bounding rectangle in window coordinates.

### Output

The result type is INTEGER(4) . The result is zero if successful; otherwise, a negative value.

---

## SAVEJPEG

*Saves an image from a specified portion of the screen into a JPEG graphic file.*

---

### Prototype

```
INTERFACE
    INTEGER(4) FUNCTION SAVEJPEG(FNAME,X1,Y1,X2,Y2,
                                JPGQUALITY)

    CHARACTER(LEN=*) FNAME
    INTEGER(4) X1,Y1,X2,Y2,JPGQUALITY
END FUNCTION
END INTERFACE
```

FNAME	Input. CHARACTER(LEN=*) . Path of the bitmap file.
X1,Y1	Input. INTEGER(4) . Viewport coordinates for upper-left corner of the screen image to be captured.
X2,Y2	Input. INTEGER(4) . Viewport coordinates for lower-right corner of the screen image to be captured.
JPGQUALITY	Input. INTEGER(4) . Quality of stored JPEG image. [0-100] where highest quality is 100.

### Description

The `SAVEJPEG` function captures the screen image within a rectangle defined by the upper-left and lower-right screen coordinates and stores the image as a JPEG graphic file specified by `FNAME`.

`SAVEJPEG` defines the bounding rectangle in viewport coordinates.

### Output

The result type is `INTEGER(4)`. The result is zero if successful; otherwise, a negative value.



---

## SAVEJPEG\_W

*Saves an image from a specified portion of the screen into a JPEG graphic file.*

---

### Prototype

INTERFACE

```
INTEGER(4) FUNCTION SAVEJPEG_W(FNAME, WX1, WY1,
                                WX2, WY2, JPGWQUALITY)
    CHARACTER(LEN=*) FNAME
    DOUBLE PRECISION WX1, WY1, WX2, WY2, WJPGQUALITY
END FUNCTION
```

END INTERFACE

FNAME	Input. CHARACTER(LEN=*) . Path of the bitmap file.
WX1, WY1	Input. REAL(8) . Viewport coordinates for upper-left corner of the screen image to be captured.
WX2, WY2	Input. REAL(8) . Viewport coordinates for lower-right corner of the screen image to be captured.
JPGWQUALITY	Input. INTEGER(4) . Quality of stored JPEG image. [0-100] where highest quality is 100.

### Description

The SAVEJPEG\_W function captures the screen image within a rectangle defined by the upper-left and lower-right screen coordinates and stores the image as a JPEG graphic file specified by FNAME.

SAVEJPEG\_W defines the bounding rectangle in window coordinates

### Output

The result type is INTEGER(4) . The result is zero if successful; otherwise, a negative value.

---

## SCROLLTEXTWINDOW

*Scrolls the contents of a text window.*

---

### Prototype

```
INTERFACE
  SUBROUTINE SCROLLTEXTWINDOW(ROWS)
    INTEGER(2) ROWS
  END SUBROUTINE
END INTERFACE
```

ROWS                    Input. INTEGER(2). Number of rows to scroll.

### Description

The SCROLLTEXTWINDOW subroutine scrolls the text in a text window (previously defined by SETTEXTWINDOW). The default text window is the entire window.

The *rows* argument specifies the number of lines to scroll. A positive value for *rows* scrolls the window up (the usual direction); a negative value scrolls the window down. Specifying a number larger than the height of the current text window is equivalent to calling CLEARSCREEN (\$GWINDOW). A value of 0 for ROWS has no effect.

---

## SETBKCOLOR

*Sets the current background color index for both text and graphics.*

---

### Prototype

```
INTERFACE
  FUNCTION SETBKCOLOR ( COLOR )
    INTEGER ( 4 ) SETBKCOLOR , COLOR
  END FUNCTION
END INTERFACE
```

COLOR            Input. INTEGER ( 4 ) . Color index to set the background color to.

### Description

SETBKCOLOR changes the background color index for both text and graphics. The color index of text over the background color is set with SETTEXTCOLOR. The color index of graphics over the background color (used by drawing functions such as FLOODFILL and ELLIPSE) is set with SETCOLOR. These non-RGB color functions use color indexes, not true color values, and limit the user to colors in the palette, at most 256. For access to all system colors, use SETBKCOLORRGB, SETCOLORRGB, and SETTEXTCOLORRGB.

Changing the background color index does not change the screen immediately. The change becomes effective when CLEARSCREEN is executed or when doing text input or output, such as with READ, WRITE, or OUTTEXT. The graphics output function OUTGTEXT does not affect the color of the background.

Generally, INTEGER ( 4 ) color arguments refer to color values and INTEGER ( 2 ) color arguments refer to color indexes. The two exceptions are GETBKCOLOR and SETBKCOLOR. The default background color index is 0, which is associated with black unless the user remaps the palette with REMAPPALETTERGB.

## Output

The result type is `INTEGER( 4 )`. The result is the previous background color index.

---

# SETCLIPRGN

*Limits graphics output to part of the screen.*

---

## Prototype

```
INTERFACE
  SUBROUTINE SETCLIPRGN( X1 , Y1 , X2 , Y2 )
    INTEGER( 2 ) X1 , Y1 , X2 , Y2
  END SUBROUTINE
END INTERFACE
```

<code>X1 , Y1</code>	Input. <code>INTEGER( 2 )</code> . Physical coordinates for upper-left corner of clipping region.
<code>X2 , Y2</code>	Input. <code>INTEGER( 2 )</code> . Physical coordinates for lower-right corner of clipping region.

## Description

The `SETCLIPRGN` function limits the display of subsequent graphics output and font text output to that which fits within a designated area of the screen (the "clipping region"). The physical coordinates `(X1 , Y1)` and `(X2 , Y2)` are the upper-left and lower-right corners of the rectangle that defines the clipping region. The `SETCLIPRGN` function does not change the viewport-coordinate system; it merely masks graphics output to the screen.

`SETCLIPRGN` affects graphics and font text output only, such as `OUTGTEXT`. To mask the screen for text output using `OUTTEXT`, use `SETTEXTWINDOW`.

---

## SETCOLOR

*Sets the current graphics color index.*

---

### Prototype

```
INTERFACE
  FUNCTION SETCOLOR (COLOR)
    INTEGER ( 2 ) SETCOLOR
    INTEGER ( 2 ) COLOR
  END FUNCTION
END INTERFACE
```

COLOR            Input. INTEGER ( 2 ). Color index to set the current graphics color to.

### Description

The SETCOLOR function sets the current graphics color index, which is used by graphics functions such as ELLIPSE. The background color index is set with SETBKCOLOR. The color index of text over the background color is set with SETTEXTCOLOR. These non-RGB color functions use color indexes, not true color values, and limit the user to colors in the palette, at most 256. For access to all system colors, use SETCOLORRGB, SETBKCOLORRGB, and SETTEXTCOLORRGB.

### Output

The result type is INTEGER ( 2 ). The result is the previous color index if successful; otherwise, -1.

---

## SETFILLMASK

*Sets the current fill mask to a new pattern.*

---

### Prototype

```
INTERFACE
  SUBROUTINE SETFILLMASK (MASK )
    INTEGER ( 1 ) MASK ( 8 )
  END SUBROUTINE
END INTERFACE
```

**MASK**                      Input. INTEGER ( 1 ). One-dimensional array of length 8.

### Description

There are 8 bytes in MASK, and each of the 8 bits in each byte represents a pixel, creating an 8x8 pattern. The first element (byte) of MASK becomes the top 8 bits of the pattern, and the eighth element (byte) of MASK becomes the bottom 8 bits.

During a fill operation, pixels with a bit value of 1 are set to the current graphics color, while pixels with a bit value of zero are set to the current background color. The current graphics color is set with SETCOLORRGB or SETCOLOR. The 8-byte mask is replicated over the entire fill area. If no fill mask is set (with SETFILLMASK), or if the mask is all ones, solid current color is used in fill operations.

The fill mask controls the fill pattern for graphics routines (FLOODFILLRGB, PIE, ELLIPSE, POLYGON, and RECTANGLE).

To change the current fill mask, determine the array of bytes that corresponds to the desired bit pattern and set the pattern with SETFILLMASK, as in the following example.

# SETLINESTYLE

*Sets the current line style to a new line style.*

## Prototype

```
INTERFACE
  SUBROUTINE SETLINESTYLE(MASK)
    INTEGER(2) MASK
  END SUBROUTINE
END INTERFACE

MASK          Input. INTEGER(2). Desired Quickwin line-style
               mask. (See the table below.)
```

## Description

The mask is mapped to the style that most closely equivalences the the percentage of the bits in the mask that are set. The style produces lines that cover a certain percentage of the pixels in that line.

SETLINESTYLE sets the style used in drawing a line. You can choose from the following styles:

QuickWin Mask	Internal Windows Style	Selection Criteria	Appearance
0xFFFF	PS_SOLID	16 bits on	_____
0xEEEE	PS_DASH	11 to 15 bits on	-----
0xECEC	PS_DASHDOT	10 bits on	-.-.-.-.-
0xECCC	PS_DASHDOTDOT	9 bits on	-.-.-.-.-
0AAAAA	PS_DOT	1 to 8 bits on	.....
0x0000	PS_NULL	0 bits on	

SETLINESTYLE affects the drawing of straight lines as in LINETO, POLYGON, and RECTANGLE, but not the drawing of curved lines as in ARC, ELLIPSE, or PIE.

The current graphics color is set with SETCOLORRGB or SETCOLOR. SETWRITEMODE affects how the line is displayed.

---

## SETPIXEL

*Sets a pixel at a specified location to the current graphics color index.*

---

### Prototype

```
INTERFACE
  FUNCTION SETPIXEL(X,Y)
    INTEGER(2) SETPIXEL,X,Y
  END FUNCTION
END INTERFACE
```

X,Y                      Input. INTEGER(2). Viewport coordinates for target pixel.

### Description

SETPIXEL sets the specified pixel to the current graphics color index. The current graphics color index is set with SETCOLOR and retrieved with GETCOLOR. The non-RGB color functions (such as SETCOLOR and SETPIXELS) use color indexes rather than true color values.

### Output

The result type is INTEGER(2). The result is the previous color index of the target pixel if successful; otherwise, -1 (for example, if the pixel lies outside the clipping region).



---

## SETPIXEL\_W

*Sets a pixel at a specified location to the current graphics color index.*

---

### Prototype

```
INTERFACE
  FUNCTION SETPIXEL_W(WX,WY)
    INTEGER(2) SETPIXEL_W
    DOUBLE PRECISION WX,WY
  END FUNCTION
END INTERFACE
```

WX,WY                      Input. REAL(8). Window coordinates for target pixel.

### Description

SETPIXEL\_W sets the specified pixel to the current graphics color index. The current graphics color index is set with SETCOLOR and retrieved with GETCOLOR. The non-RGB color functions (such as SETCOLOR and SETPIXELS) use color indexes rather than true color values.

### Output

The result type is INTEGER(2). The result is the previous color index of the target pixel if successful; otherwise, -1 (for example, if the pixel lies outside the clipping region).

---

## SETPIXELS

*Sets the color indexes of multiple pixels.*

---

### Prototype

```

INTERFACE
  SUBROUTINE SETPIXELS(N, X, Y, COLOR)
    INTEGER(4)N           ! size of arrays
    INTEGER(2)X(*),Y(*)! x, y coordinates
    INTEGER(2) COLOR(*)! palette indices
  END SUBROUTINE
END INTERFACE

```

N	Input. INTEGER(4). Number of pixels to set. Sets the number of elements in the other arguments.
X, Y	Input. INTEGER(2). Parallel arrays containing viewport coordinates of pixels to set.
COLOR	Input. INTEGER(2). Array containing color indexes to set the pixels to.

### Description

SETPIXELS sets the pixels specified in the arrays *x* and *y* to the color indexes in *COLOR*. These arrays are parallel: the first element in each of the three arrays refers to a single pixel, the second element refers to the next pixel, and so on.

If any of the pixels are outside the clipping region, those pixels are ignored. Calls to SETPIXELS with *N* less than 1 are also ignored. SETPIXELS is a much faster way to set multiple pixel color indexes than individual calls to SETPIXEL.

Unlike SETPIXELS, SETPIXELSRGB gives access to the full color capacity of the system by using direct color values rather than indexes to a palette. The non-RGB color functions (such as SETPIXELS and SETCOLOR) use color indexes rather than true color values.

If you use color indexes, you are limited to the colors available in the palette, at most 256. Some display adapters (SVGA and true color) are capable of creating 262,144 (256K) colors or more. To access any available color, you need to specify an explicit RGB value with an RGB color function, rather than a palette index with a non-RGB color function.

---

## SETTEXTCOLOR

*Sets the current text color index.*

---

### Prototype

```
INTERFACE
  FUNCTION SETTEXTCOLOR ( INDEX )
    INTEGER ( 2 ) SETTEXTCOLOR , INDEX
  END FUNCTION
END INTERFACE
```

INDEX            Input. INTEGER ( 2 ) . Color index to set the text color to.

### Description

SETTEXTCOLOR sets the current text color index. The default value is 15, which is associated with white unless the user remaps the palette.

GETTEXTCOLOR returns the text color index set by SETTEXTCOLOR.

SETTEXTCOLOR affects text output with OUTTEXT, WRITE, and PRINT.

### Output

The result type is INTEGER ( 2 ) . The result is the previous text color index.

---

## SETTEXTPOSITION

*Sets the current text position to a specified position relative to the current text window.*

---

### Prototype

```
INTERFACE
  SUBROUTINE SETTEXTPOSITION(ROW, COL, S)
    INTEGER(2) ROW, COL
    integer*2 col
    STRUCTURE /RCCOORD/
      INTEGER(2) ROW, COL
      integer*2 col
    END STRUCTURE
    RECORD /RCCOORD/s
  END SUBROUTINE
END INTERFACE
```

ROW                    Input. INTEGER( 2 ). New text row position.

COL                    Input. INTEGER( 2 ). New text column position.

S                      Output. Derived type rccoord. Previous text position.

```
TYPE RCCOORD
  INTEGER(2) ROW ! Row coordinate
  INTEGER(2) COL ! Column coordinate
END TYPE RCCOORD
```

### Description

Subsequent text output with the OUTTEXT function (as well as standard console I/O statements, such as PRINT and WRITE) begins at the point (ROW, COL).

---

## SETTEXTWINDOW

*Sets the current text window.*

---

### Prototype

```
INTERFACE
  SUBROUTINE SETTEXTWINDOW(R1,C1,R2,C2)
    INTEGER(2) R1,C1,R2,C2
  END SUBROUTINE
END INTERFACE
```

R1,C1	Input. INTEGER(2). Row and column coordinates for upper-left corner of the text window.
R2,C2	Input. INTEGER(2). Row and column coordinates for lower-right corner of the text window.

### Description

SETTEXTWINDOW specifies a window in row and column coordinates where text output to the screen using OUTTEXT, WRITE, or PRINT will be displayed. You set the text location within this window with SETTEXTPOSITION.

Text is output from the top of the window down. When the window is full, successive lines overwrite the last line.

SETTEXTWINDOW does not affect the output of the graphics text routine OUTGTEXT. Use the SETVIEWPORT function to control the display area for graphics output.

---

## SETVIEWORG

*Moves the viewport-coordinate origin  
(0, 0) to the specified physical point.*

---

### Prototype

```
INTERFACE
  SUBROUTINE SETVIEWORG(X,Y,S)
    INTEGER(2) X,Y
    integer*2 y
    STRUCTURE /XYCOORD/
      INTEGER(2) XCOORD,YCOORD
    END STRUCTURE
    RECORD /XYCOORD/s
  END SUBROUTINE
END INTERFACE
```

**X,Y**                    Input. INTEGER(2). Physical coordinates of new  
viewport origin.

**S**                      Output. Derived type XYCOORD. Physical coordinates of  
the previous viewport origin.

```
TYPE XYCOORD
  INTEGER(2) XCOORD ! x-coordinate
  INTEGER(2) YCOORD ! y-coordinate
END TYPE XYCOORD
```

### Description

The XYCOORD type variable *s*, returns the physical coordinates of the previous viewport origin.

---

## SETVIEWPORT

*Redefines the graphics viewport*

---

### Prototype

```
INTERFACE
  SUBROUTINE SETVIEWPORT(X1,Y1,X2,Y2)
    INTEGER(2) X1,Y1,X2,Y2
  END SUBROUTINE
END INTERFACE
```

X1 , Y1	Input. INTEGER ( 2 ) . Physical coordinates for upper-left corner of viewport.
X2 , Y2	Input. INTEGER ( 2 ) . Physical coordinates for lower-right corner of viewport.

### Description

Redefines the graphics viewport by defining a clipping region in the same manner as SETCLIPRGN and then setting the viewport-coordinate origin to the upper-left corner of the region. The physical coordinates (X1 , Y1) and (X2 , Y2) are the upper-left and lower-right corners of the rectangular clipping region. Any window transformation done with the SETWINDOW function is relative to the viewport, not the entire screen.

---

## SETWINDOW

*Defines a window bound by the specified coordinates.*

---

### Prototype

```
INTERFACE
  FUNCTION SETWINDOW( FINVERT , WX1 , WY1 , WX2 , WY2 )
    INTEGER( 2 ) SETWINDOW
    LOGICAL( 2 ) FINVERT
    DOUBLE PRECISION WX1 , WY1 , WX2 , WY
  END FUNCTION
END INTERFACE
```

FINVERT	Input. LOGICAL( 2 ). Direction of increase of the y-axis. If FINVERT is .TRUE. , the y-axis increases from the window bottom to the window top (as Cartesian coordinates). If FINVERT is .FALSE. , the y-axis increases from the window top to the window bottom (as pixel coordinates).
WX1 , WY1	Input. REAL( 8 ). Window coordinates for upper-left corner of window.
WX2 , WY2	Input. REAL( 8 ). Window coordinates for lower-right corner of window.

### Description

The SETWINDOW function determines the coordinate system used by all window-relative graphics routines. Any graphics routines that end in \_W (such as ARC\_W, RECTANGLE\_W, and LINETO\_W) use the coordinate system set by SETWINDOW.

Any window transformation done with the SETWINDOW function is relative to the viewport, not the entire screen.



An arc drawn using inverted window coordinates is not an upside-down version of an arc drawn with the same parameters in a noninverted window. The arc is still drawn counterclockwise, but the points that define where the arc begins and ends are inverted.

If WX1 equals WX2 or WY1 equals WY2, SETWINDOW fails.

### Output

The result type is `INTEGER ( 2 )`. The result is nonzero if successful; otherwise, 0 (for example, if the program that calls SETWINDOW is not in a graphics mode).

---

## SETWRITEMODE

*Sets the current logical write mode.*

---

Prototype

```
INTERFACE
  FUNCTION SETWRITEMODE ( WMODE )
    INTEGER ( 2 ) SETWRITEMODE , WMODE
  END FUNCTION
END INTERFACE
```

WMODE      Input. `INTEGER ( 2 )`. Write mode to be set. One of the following symbolic constants :

- \$GPSET    Causes lines to be drawn in the current graphics color. (Default)
- \$GAND     Causes lines to be drawn in the color that is the logical AND of the current graphics color and the current background color.
- \$GOR      Causes lines to be drawn in the color that is the logical OR of the current graphics color and the current background color.

`$GPRESET` Causes lines to be drawn in the color that is the logical NOT of the current graphics color.

`$GXOR` Causes lines to be drawn in the color that is the logical exclusive OR (XOR) of the current graphics color and the current background color.

In addition, one of the following binary raster operation constants can be used (described in the online documentation for the WIN32 API SetROP2):

`$GR2_BLACK`

`$GR2_NOTMERGEPEN`

`$GR2_MASKNOTPEN`

`$GR2_NOTCOPYPEN` (same as `$GPRESET`)

`$GR2_MASKPENNOT`

`$GR2_NOT`

`$GR2_XORPEN` (same as `$GXOR`)

`$GR2_NOTMASKPEN`

`$GR2_MASKPEN` (same as `$GAND`)

`$GR2_NOTXORPEN`

`$GR2_NOP`

`$GR2_MERGENOTPEN`

`$GR2_COPYPEN` (same as `$GPSET`)

`$GR2_MERGEPENNOT`

`$GR2_MERGEPEN` (same as `$GOR`)

`$GR2_WHITE`

## Description

Sets the current logical write mode, which is used when drawing lines with the `LINETO`, `POLYGON`, and `RECTANGLE` functions. The current graphics color is set with `SETCOLORRGB` (or `SETCOLOR`) and the current

background color is set with SETBKCOLORRGB (or SETBKCOLOR). As an example, suppose you set the background color to yellow (#00FFFF) and the graphics color to purple (#FF00FF) with the following commands:

```
OLDCOLOR = SETBKCOLORRGB (#00FFFF)
CALL CLEARSCREEN ($GCLEARSCREEN)
OLDCOLOR = SETCOLORRGB (#FF00FF)
```

If you then set the write mode with the \$GAND option, lines are drawn in red (#0000FF); with the \$GOR option, lines are drawn in white (#FFFFFF); with the \$GXOR option, lines are drawn in turquoise (#00FF00); and with the \$GPRESET option, lines are drawn in green (#00FF00). Setting the write mode to \$GPSET causes lines to be drawn in the graphics color.

### Output

The result type is INTEGER( 2 ). The result is the previous write mode if successful; otherwise, -1.

---

## WRAPON

*Controls the text output wrap.*

---

### Prototype

```
INTERFACE
  FUNCTION WRAPON (OPTION)
    INTEGER( 2 ) WRAPON, OPTION
  END FUNCTION
END INTERFACE
```

OPTION	Input. INTEGER( 2 ). Wrap mode. One of the following symbolic constants:
\$GWRAPOFF	Truncates lines at right edge of window border.
\$GWRAPON	Wraps lines at window border, scrolling if necessary.

**Description**

Controls whether text output with the OUTTEXT function wraps to a new line or is truncated when the text output reaches the edge of the defined text window. WRAPON does not affect font routines such as OUTGTEXT.

**Output**

The result type is INTEGER ( 2 ). The result is the previous value of OPTION.

## Per Pixel and Color Functions

---

### GETCOLRRGB

*Gets the current graphics color  
Red-Green-Blue (RGB) value.*

---

**Prototype**

```
INTERFACE
  FUNCTION GETCOLRRGB ( )
    integer*4 GETCOLRRGB
  END FUNCTION
END INTERFACE
```

**Description**

Gets the current graphics color Red-Green-Blue (RGB) value (used by graphics functions such as ARC, ELLIPSE, and FLOODFILLRGB). In each RGB color value, each of the three colors, red, green, and blue, is represented by an eight-bit value (2 hex digits). In the value you retrieve with GETCOLRRGB, red is the rightmost byte, followed by green and blue. The RGB value's internal structure is as follows:

Larger numbers correspond to stronger color intensity with binary 111111 (hex FF) the maximum for each of the three components. For example, #0000FF yields full-intensity red, #00FF00 full-intensity green, #FF0000 full-intensity blue, and #FFFFFF full-intensity for all three, resulting in bright white.

GETCOLORRGB returns the RGB color value of graphics over the background color (used by graphics functions such as ARC, ELLIPSE, and FLOODFILLRGB), set with SETCOLORRGB. GETBKCOLORRGB returns the RGB color value of the current background for both text and graphics, set with SETBKCOLORRGB. GETTEXTCOLORRGB returns the RGB color value of text over the background color (used by text functions such as OUTTEXT, WRITE, and PRINT), set with SETTEXTCOLORRGB.

SETCOLORRGB (and the other RGB color selection functions SETBKCOLORRGB and SETTEXTCOLORRGB) sets the color to a value chosen from the entire available range. The non-RGB color functions (SETCOLOR, SETBKCOLOR, and SETTEXTCOLOR) use color indexes rather than true color values. If you use color indexes, you are limited to the colors available in the palette, at most 256. Some display adapters (SVGA and true color) are capable of creating 262,144 (256K) colors or more. To access any available color, you need to specify an explicit RGB value with an RGB color function, rather than a palette index with a non-RGB color function.

## Output

The result type is `INTEGER ( 4 )`. The result is the RGB value of the current graphics color.

---

## GETBKCOLORRGB

*Gets the current background  
Red-Green-Blue (RGB) color value for  
both text and graphics.*

---

### Prototype

```
INTERFACE
  FUNCTION GETBKCOLORRGB ( )
    INTEGER ( 4 ) GETBKCOLORRGB
  END FUNCTION
END INTERFACE
```

### Description

In each RGB color value, each of the three colors, red, green, and blue, is represented by an eight-bit value (2 hex digits). In the value you retrieve with GETBKCOLORRGB, red is the rightmost byte, followed by green and blue. The RGB value's internal structure is as follows:

Larger numbers correspond to stronger color intensity with binary 1111111 (hex FF) the maximum for each of the three components. For example, #0000FF yields full-intensity red, #00FF00 full-intensity green, #FF0000 full-intensity blue, and #FFFFFF full-intensity for all three, resulting in bright white.

GETBKCOLORRGB returns the RGB color value of the current background for both text and graphics, set with SETBKCOLORRGB. The RGB color value of text over the background color (used by text functions such as OUTTEXT, WRITE, and PRINT) is set with SETTEXTCOLORRGB and returned with GETTEXTCOLORRGB. The RGB color value of graphics over the background color (used by graphics functions such as ARC, OUTGTEXT, and FLOODFILLRGB) is set with SETCOLORRGB and returned with GETCOLORRGB.

SETBKCOLORRGB (and the other RGB color selection functions SETCOLORRGB and SETTEXTCOLORRGB) sets the color to a value chosen from the entire available range. The non-RGB color functions (SETBKCOLOR, SETCOLOR, and SETTEXTCOLOR) use color indexes rather than true color values. If you use color indexes, you are limited to the colors available in the palette, at most 256. Some display adapters (SVGA and true color) are capable of creating 262,144 (256K) colors or more. To access any available color, you need to specify an explicit RGB value with an RGB color function, rather than a palette index with a non-RGB color function.

### Output

The result type is `INTEGER ( 4 )`. The result is the RGB value of the current background color for both text and graphics.

---

## GETPIXELRGB

*Returns the Red-Green-Blue (RGB) color value of the pixel at a specified location.*

---

### Prototype

```
INTERFACE
  FUNCTION GETPIXELRGB ( X , Y )
    INTEGER ( 4 ) GETPIXELRGB
    INTEGER ( 2 ) X , Y
  END FUNCTION
END INTERFACE
```

`X , Y`                      Input. `INTEGER ( 2 )`. Viewport coordinates for pixel position.

## Description

In each RGB color value, each of the three colors, red, green, and blue, is represented by an eight-bit value (2 hex digits). In the value you retrieve with `GETPIXELRGB`, red is the rightmost byte, followed by green and blue. The RGB value's internal structure is as follows:

Larger numbers correspond to stronger color intensity with binary 1111111 (hex FF) the maximum for each of the three components. For example, #0000FF yields full-intensity red, #00FF00 full-intensity green, #FF0000 full-intensity blue, and #FFFFFF full-intensity for all three, resulting in bright white.

`GETPIXELRGB` returns the true color value of the pixel, set with `SETPIXELRGB`, `SETCOLORRGB`, `SETBKCOLORRGB`, or `SETTEXTCOLORRGB`, depending on the pixel's position and the current configuration of the screen.

`SETPIXELRGB` (and the other RGB color selection functions `SETCOLORRGB`, `SETBKCOLORRGB`, and `SETTEXTCOLORRGB`) sets colors to a color value chosen from the entire available range. The non-RGB color functions (`SETPIXELS`, `SETCOLOR`, `SETBKCOLOR`, and `SETTEXTCOLOR`) use color indexes rather than true color values. If you use color indexes, you are limited to the colors available in the palette, at most 256. Some display adapters (SVGA and true color) are capable of creating 262,144 (256K) colors or more. To access any available color, you need to specify an explicit Red-Green-Blue (RGB) value with an RGB color function, rather than a palette index with a non-RGB color function.

## Output

The result type is `INTEGER ( 4 )`. The result is the pixel's current RGB color value.



---

## GETPIXELRGB\_W

*Returns the Red-Green-Blue (RGB) color value of the pixel at a specified location.*

---

### Prototype

```
INTERFACE
  FUNCTION GETPIXELRGB_W(WX,WY)
    INTEGER(4) GETPIXELRGB_W
    REAL*8      WX,WY
    REAL*8      wy
  END FUNCTION
END INTERFACE
```

WX, WY            Input. REAL(8). Window coordinates for pixel position.

### Description

In each RGB color value, each of the three colors, red, green, and blue, is represented by an eight-bit value (2 hex digits). In the value you retrieve with GETPIXELRGB\_W, red is the rightmost byte, followed by green and blue. The RGB value's internal structure is as follows:

Larger numbers correspond to stronger color intensity with binary 1111111 (hex FF) the maximum for each of the three components. For example, #0000FF yields full-intensity red, #00FF00 full-intensity green, #FF0000 full-intensity blue, and #FFFFFF full-intensity for all three, resulting in bright white.

GETPIXELRGB\_W returns the true color value of the pixel, set with SETPIXELRGB\_W, SETCOLORRGB, SETBKCOLORRGB, or SETTEXTCOLORRGB, depending on the pixel's position and the current configuration of the screen.

SETPIXELRGB\_W (and the other RGB color selection functions SETCOLORRGB, SETBKCOLORRGB, and SETTEXTCOLORRGB) sets colors to a color value chosen from the entire available range. The non-RGB color functions (SETPIXELS, SETCOLOR, SETBKCOLOR, and SETTEXTCOLOR) use color indexes rather than true color values. If you use color indexes, you are limited to the colors available in the palette, at most 256. Some display adapters (SVGA and true color) are capable of creating 262,144 (256K) colors or more. To access any available color, you need to specify an explicit Red-Green-Blue (RGB) value with an RGB color function, rather than a palette index with a non-RGB color function.

### Output

The result type is `INTEGER ( 4 )`. The result is the pixel's current RGB color value.

---

## SETPIXELSRGB

*Sets multiple pixels to the given  
Red-Green-Blue (RGB) color.*

---

### Prototype

```

INTERFACE
  SUBROUTINE SETPIXELSRGB ( N , X , Y , COLOR )
    INTEGER ( 4 ) N
    INTEGER ( 2 ) X ( * ) , Y ( * )
    INTEGER ( 4 ) COLOR ( * )
  END SUBROUTINE
END INTERFACE

```

N	Input. <code>INTEGER ( 4 )</code> . Number of pixels to be changed. Determines the number of elements in arrays <i>x</i> and <i>y</i> .
X , Y	Input. <code>INTEGER ( 2 )</code> . Parallel arrays containing viewport coordinates of the pixels to set.

**COLOR**                      Input. `INTEGER ( 4 )`. Array containing the RGB color values to set the pixels to. Range and result depend on the system's display adapter.

### Description

`SETPIXELSRGB` sets the pixels specified in the arrays *x* and *y* to the RGB color values in **COLOR**. These arrays are parallel: the first element in each of the three arrays refers to a single pixel, the second element refers to the next pixel, and so on.

In each RGB color value, each of the three colors, red, green, and blue, is represented by an eight-bit value (2 hex digits). In the value you set with `SETPIXELSRGB`, red is the rightmost byte, followed by green and blue. The RGB value's internal structure is as follows:

Larger numbers correspond to stronger color intensity with binary 1111111 (hex FF) the maximum for each of the three components. For example, #0000FF yields full-intensity red, #00FF00 full-intensity green, #FF0000 full-intensity blue, and #FFFFFF full-intensity for all three, resulting in bright white.

A good use for `SETPIXELSRGB` is as a buffering form of `SETPIXELRGB`, which can improve performance substantially. The example code shows how to do this.

If any of the pixels are outside the clipping region, those pixels are ignored. Calls to `SETPIXELSRGB` with *n* less than 1 are also ignored.

`SETPIXELSRGB` (and the other RGB color selection functions such as `SETPIXELRGB` and `SETCOLORRGB`) sets colors to values chosen from the entire available range. The non-RGB color functions (such as `SETPIXELS` and `SETCOLOR`) use color indexes rather than true color values.

If you use color indexes, you are limited to the colors available in the palette, at most 256. Some display adapters (SVGA and true color) are capable of creating 262,144 (256K) colors or more. To access any available color, you need to specify an explicit RGB value with an RGB color function, rather than a palette index with a non-RGB color function.

---

## GETPIXELSRGB

*Returns the Red-Green-Blue (RGB)  
color values of multiple pixels.*

---

### Prototype

```
INTERFACE
  SUBROUTINE GETPIXELSRGB(N,X,Y,COLOR)
    INTEGER(4) N
    INTEGER(2) X(*),Y(*)
    INTEGER(4) COLOR(*)
  END SUBROUTINE
END INTERFACE
```

N	Input. INTEGER(4). Number of pixels to get. Sets the number of elements in the other argument arrays.
X,Y	Input. INTEGER(2). Parallel arrays containing viewport coordinates of pixels.
COLOR	Output. INTEGER(4). Array to be filled with RGB color values of the pixels at <i>x</i> and <i>y</i> .

### Description

GETPIXELS fills in the array COLOR with the RGB color values of the pixels specified by the two input arrays *x* and *y*. These arrays are parallel: the first element in each of the three arrays refers to a single pixel, the second element refers to the next pixel, and so on.

In each RGB color value, each of the three colors, red, green, and blue, is represented by an eight-bit value (2 hex digits). In the value you retrieve with GETPIXELSRGB, red is the rightmost byte, followed by green and blue. The RGB value's internal structure is as follows:

Larger numbers correspond to stronger color intensity with binary 111111 (hex FF) the maximum for each of the three components. For example, #0000FF yields full-intensity red, #00FF00 full-intensity green, #FF0000 full-intensity blue, and #FFFFFF full-intensity for all three, resulting in bright white.

GETPIXELSRGB is a much faster way to acquire multiple pixel RGB colors than individual calls to GETPIXELRGB. GETPIXELSRGB returns an array of true color values of multiple pixels, set with SETPIXELSRGB, SETCOLORRGB, SETBKCOLORRGB, or SETTEXTCOLORRGB, depending on the pixels' positions and the current configuration of the screen.

SETPIXELSRGB (and the other RGB color selection functions SETCOLORRGB, SETBKCOLORRGB, and SETTEXTCOLORRGB) sets colors to a color value chosen from the entire available range. The non-RGB color functions (SETPIXELS, SETCOLOR, SETBKCOLOR, and SETTEXTCOLOR) use color indexes rather than true color values. If you use color indexes, you are limited to the colors available in the palette, at most 256. Some display adapters (SVGA and true color) are capable of creating 262,144 (256K) colors or more. To access any available color, you need to specify an explicit RGB value with an RGB color function, rather than a palette index with a non-RGB color function.

---

## SETCOLORRGB

*Sets the current graphics color to the specified Red-Green-Blue (RGB) value.*

---

### Prototype

```
INTERFACE
    FUNCTION SETCOLORRGB (COLOR)
        INTEGER (4) SETCOLORRGB, COLOR
    END FUNCTION
END INTERFACE
```

**COLOR**                      Input. `INTEGER( 4 )`. RGB color value to set the current graphics color to. Range and result depend on the system's display adapter.

### Description

In each RGB color value, each of the three colors, red, green, and blue, is represented by an eight-bit value (2 hex digits). In the value you specify with `SETCOLORRGB`, red is the rightmost byte, followed by green and blue. The RGB value's internal structure is as follows:

Larger numbers correspond to stronger color intensity with binary 1111111 (hex FF) the maximum for each of the three components. For example, #0000FF yields full-intensity red, #00FF00 full-intensity green, #FF0000 full-intensity blue, and #FFFFFF full-intensity for all three, resulting in bright white.

`SETCOLORRGB` sets the RGB color value of graphics over the background color, used by the following graphics functions: `ARC`, `ELLIPSE`, `FLOODFILL`, `LINETO`, `OUTGTEXT`, `PIE`, `POLYGON`, `RECTANGLE`, and `SETPIXEL`. `SETBKCOLORRGB` sets the RGB color value of the current background for both text and graphics. `SETTEXTCOLORRGB` sets the RGB color value of text over the background color (used by text functions such as `OUTTEXT`, `WRITE`, and `PRINT`).

`SETCOLORRGB` (and the other RGB color selection functions `SETBKCOLORRGB`, and `SETTEXTCOLORRGB`) sets the color to a value chosen from the entire available range. The non-RGB color functions (`SETCOLOR`, `SETBKCOLOR`, and `SETTEXTCOLOR`) use color indexes rather than true color values. If you use color indexes, you are limited to the colors available in the palette, at most 256. Some display adapters (SVGA and true color) are capable of creating 262,144 (256K) colors or more. To access any available color, you need to specify an explicit RGB value with an RGB color function, rather than a palette index with a non-RGB color function.

### Output

The result type is `INTEGER( 4 )`. The result is the previous RGB color value.

---

## SETBKCOLORRGB

*Sets the current background color to the given Red-Green-Blue (RGB) value.*

---

### Prototype

```
INTERFACE
  FUNCTION SETBKCOLORRGB(color)
    INTEGER(4) SETBKCOLORRGB,color
  END FUNCTION
END INTERFACE
```

**COLOR**            Input. `INTEGER(4)`. RGB color value to set the background color to. Range and result depend on the system's display adapter.

### Description

In each RGB color value, each of the three colors, red, green, and blue, is represented by an eight-bit value (2 hex digits). In the value you specify with `SETBKCOLORRGB`, red is the rightmost byte, followed by green and blue. The RGB value's internal structure is as follows:

Larger numbers correspond to stronger color intensity with binary 1111111 (hex FF) the maximum for each of the three components. For example, #0000FF yields full-intensity red, #00FF00 full-intensity green, #FF0000 full-intensity blue, and #FFFFFF full-intensity for all three, resulting in bright white.

`SETBKCOLORRGB` sets the RGB color value of the current background for both text and graphics. The RGB color value of text over the background color (used by text functions such as `OUTTEXT`, `WRITE`, and `PRINT`) is set with `SETTEXTCOLORRGB`. The RGB color value of graphics over the background color (used by graphics functions such as `ARC`, `OUTGTEXT`, and `FLOODFILLRGB`) is set with `SETCOLORRGB`.

SETBKCOLORRGB (and the other RGB color selection functions SETCOLORRGB, and SETTEXTCOLORRGB) sets the color to a value chosen from the entire available range. The non-RGB color functions (SETCOLOR, SETBKCOLOR, and SETTEXTCOLOR) use color indexes rather than true color values. If you use color indexes, you are limited to the colors available in the palette, at most 256. Some display adapters (SVGA and true color) are capable of creating 262,144 (256K) colors or more. To access any available color, you need to specify an explicit RGB value with an RGB color function, rather than a palette index with a non-RGB color

### Output

The result type is `INTEGER( 4 )`. The result is the previous background RGB color value.

---

## SETPIXELRGB

*Sets a pixel at a specified location to the specified Red-Green-Blue (RGB) color value.*

---

### Prototype

```

INTERFACE
  FUNCTION SETPIXELRGB( X, Y, COLOR )
    INTEGER( 4 ) SETPIXELRGB, COLOR
    INTEGER( 2 ) X, Y
  END FUNCTION
END INTERFACE

```

<code>X, Y</code>	Input. <code>INTEGER( 2 )</code> . Viewport coordinates for target pixel.
<code>COLOR</code>	Input. <code>INTEGER( 4 )</code> . RGB color value to set the pixel to. Range and result depend on the system's display adapter.



## Description

In each RGB color value, each of the three colors, red, green, and blue, is represented by an eight-bit value (2 hex digits). In the value you specify with `SETPIXELRGB`, red is the rightmost byte, followed by green and blue. The RGB value's internal structure is as follows:

Larger numbers correspond to stronger color intensity with binary 1111111 (hex FF) the maximum for each of the three components. For example, #0000FF yields full-intensity red, #00FF00 full-intensity green, #FF0000 full-intensity blue, and #FFFFFF full-intensity for all three, resulting in bright white.

`SETPIXELRGB` (and the other RGB color selection functions such as `SETPIXELSRGB`, `SETCOLORRGB`) sets the color to a value chosen from the entire available range. The non-RGB color functions (such as `SETPIXELS` and `SETCOLOR`) use color indexes rather than true color values.

If you use color indexes, you are limited to the colors available in the palette, at most 256. Some display adapters (SVGA and true color) are capable of creating 262,144 (256K) colors or more. To access any available color, you need to specify an explicit RGB value with an RGB color function, rather than a palette index with a non-RGB color function.

## Output

The result type is `INTEGER ( 4 )`. The result is the previous RGB color value of the pixel.

---

## SETPIXELRGB\_W

*Sets a pixel at a specified location to the specified Red-Green-Blue (RGB) color value.*

---

### Prototype

```
INTERFACE
  FUNCTION SETPIXELRGB_W(X,Y,COLOR)
    INTEGER(4) SETPIXELRGB_W,COLOR
    REAL*8      WX,WY
  END FUNCTION
END INTERFACE
```

**WX,WY**            Input. REAL(8). Window coordinates for target pixel.

**COLOR**            Input. INTEGER(4). RGB color value to set the pixel to. Range and result depend on the system's display adapter.

### Description

In each RGB color value, each of the three colors, red, green, and blue, is represented by an eight-bit value (2 hex digits). In the value you specify with SETPIXELRGB\_W, red is the rightmost byte, followed by green and blue. The RGB value's internal structure is as follows:

Larger numbers correspond to stronger color intensity with binary 1111111 (hex FF) the maximum for each of the three components. For example, #0000FF yields full-intensity red, #00FF00 full-intensity green, #FF0000 full-intensity blue, and #FFFFFF full-intensity for all three, resulting in bright white.

SETPIXELRGB\_W (and the other RGB color selection functions such as SETPIXELSRGB, SETCOLORRGB) sets the color to a value chosen from the entire available range. The non-RGB color functions (such as SETPIXELS and SETCOLOR) use color indexes rather than true color values.

If you use color indexes, you are limited to the colors available in the palette, at most 256. Some display adapters (SVGA and true color) are capable of creating 262,144 (256K) colors or more. To access any available color, you need to specify an explicit RGB value with an RGB color function, rather than a palette index with a non-RGB color function.

## Output

The result type is `INTEGER ( 4 )`. The result is the previous RGB color value of the pixel.

---

## RGBTOINTEGER

*Converts three integers specifying red, green, and blue color intensities into a four-byte RGB integer.*

---

### Prototype

```
INTERFACE
  FUNCTION RGBTOINTEGER ( RED , GREEN , BLUE )
    INTEGER ( 4 ) RGBTOINTEGER , RED , GREEN , BLUE
  END FUNCTION
END INTERFACE
```

RED	Input. <code>INTEGER ( 4 )</code> . Intensity of the red component of the RGB color value. Only the lower 8 bits of RED are used.
GREEN	Input. <code>INTEGER ( 4 )</code> . Intensity of the green component of the RGB color value. Only the lower 8 bits of GREEN are used.
BLUE	Input. <code>INTEGER ( 4 )</code> . Intensity of the blue component of the RGB color value. Only the lower 8 bits of BLUE are used.

### Description

Converts three integers specifying red, green, and blue color intensities into a four-byte RGB integer for use with RGB functions and subroutines. In each RGB color value, each of the three colors, red, green, and blue, is represented by an eight-bit value (2 hex digits). In the value returned with `RGBTOINTEGER`, red is the rightmost byte, followed by green and blue. The RGB value's internal structure is as follows:

Larger numbers correspond to stronger color intensity with binary 1111111 (hex FF) the maximum for each of the three components. For example, #0000FF yields full-intensity red, #00FF00 full-intensity green, #FF0000 full-intensity blue, and #FFFFFF full-intensity for all three, resulting in bright white.

### Output

The result type is `INTEGER( 4 )`. The result is the combined RGB color value.

---

## INTERGERTORG

*Converts an RGB color value into its red, green, and blue components.*

---

### Prototype

```

INTERFACE
  SUBROUTINE INTEGER( 4 ) ( RGB, RED, GREEN, BLUE )
    INTEGER( 4 ) RGB, RED, GREEN, BLUE
  END SUBROUTINE
END INTERFACE

```

RGB	Input. <code>INTEGER( 4 )</code> . RGB color value whose red, green, and blue components are to be returned.
RED	Output. <code>INTEGER( 4 )</code> . Intensity of the red component of the RGB color value.

GREEN	Output. <code>INTEGER ( 4 )</code> . Intensity of the green component of the RGB color value.
BLUE	Output. <code>INTEGER ( 4 )</code> . Intensity of the blue component of the RGB color value.

### Description

`INTEGERTORGB` separates the four-byte RGB color value into the three components as follows:

## Font Manipulation Functions

---

### GETFONTINFO

*Gets the current font characteristics.*

---

### Prototype

```
INTERFACE
  FUNCTION GETFONTINFO(FI)
    INTEGER(2) GETFONTINFO
  STRUCTURE /FONTINFO/
    INTEGER(4) TYPE
    INTEGER(4) ASCENT
    INTEGER(4) PIXWIDTH
    INTEGER(4) PIXHEIGHT
    INTEGER(4)4 AVGWIDTH
    CHARACTER(LEN=81) FILENAME
    CHARACTER(LEN=32) FACENAME
    LOGICAL(1) ITALIC
    LOGICAL(1) EMPHASIZED
    LOGICAL(1) UNDELINE
  END STRUCTURE
```

```

        RECORD /FONTINFO/FI
        END FUNCTION
    END INTERFACE

    FI          Output. Derived type fontinfo. Set of characteristics of
                the current font.

    TYPE FONTINFO
        INTEGER(4) TYPE          ! 1 = truetype, 0 = bit map
        INTEGER(4) ASCENT        ! Pixel distance from top
                                ! to baseline
        INTEGER(4) PIXWIDTH      ! Character width in pixels,
                                ! 0=proportional
        INTEGER(4) PIXHEIGHT     ! Character height in pixels
        INTEGER(4) AVGWIDTH      ! Average character width in
                                ! pixels
        CHARACTER(32)XFACENAME  ! Font name
        LOGICAL(1) ITALIC        ! .TRUE. if current font
                                ! formatted italic
        LOGICAL(1) EMPHASIZED    ! .TRUE. if current font
                                ! formatted bold
        LOGICAL(1) UNDERLINE    ! .TRUE. if current font
                                ! formatted underlined
    END TYPE FONTINFO

```

### Description

You must initialize fonts with `INITIALIZEFONTS` before calling any font-related function, including `GETFONTINFO`.

### Output

The result type is `INTEGER( 2 )`. The result is zero if successful; otherwise, -1.

---

## GETGTEXTENT

*Returns the width in pixels required to print a given string of text with **OUTGTEXT** using the current font.*

---

### Prototype

```
INTERFACE
  FUNCTION GETGTEXTENT (TEXT)
    INTEGER ( 2 ) GETGTEXTENT
    CHARACTER ( LEN= * ) TEXT
  END FUNCTION
END INTERFACE
```

TEXT                    Input. CHARACTER ( LEN= \* ). Text to be analyzed.

### Description

Returns the width in pixels that would be required to print a given string of text (including any trailing blanks) with OUTGTEXT using the current font. This function is useful for determining the size of text that uses proportionally spaced fonts. You must initialize fonts with INITIALIZEFONTS before calling any font-related function, including GETGTEXTENT.

### Output

The result type is INTEGER ( 2 ). The result is the width of *text* in pixels if successful; otherwise, -1 (for example, if fonts have not been initialized with INITIALIZEFONTS).

---

## OUTGTEXT

*In graphics mode, sends a string of text to the screen, including any trailing blanks.*

---

### Prototype

```
INTERFACE
  SUBROUTINE OUTGTEXT (TEXT)
    CHARACTER (LEN=*) TEXT
  END SUBROUTINE
END INTERFACE
```

TEXT                      Input. CHARACTER ( LEN= \* ). String to be displayed.

### Description

In graphics mode, sends a string of text to the screen, including any trailing blanks. Text output begins at the current graphics position, using the current font set with SETFONT and the current color set with SETCOLORRGB or SETCOLOR. No formatting is provided. After it outputs the text, OUTGTEXT updates the current graphics position.

Before you call OUTGTEXT, you must call INITIALIZEFONTS.

Because OUTGTEXT is a graphics function, the color of text is affected by the SETCOLORRGB function, not by SETTEXTCOLORRGB.

---

## INITIALIZEFONTS

*Initializes Windows fonts.*

---

### Prototype

```
INTERFACE
```



```
FUNCTION INITIALIZAFONTS ( )  
    INTEGER ( 2 ) INITIALIZAFONTS  
END FUNCTION  
END INTERFACE
```

### Description

All fonts in Windows become available after a call to `INITIALIZEFONTS`. Fonts must be initialized with `INITIALIZEFONTS` before any other font-related library function (such as `GETFONTINFO`, `GETGTEXTTEXTENT`, `SETFONT`, `OUTGTEXT`) can be used.

For each window you open, you must call `INITIALIZEFONTS` before calling `SETFONT`. `INITIALIZEFONTS` needs to be executed after each new child window is opened in order for a subsequent `SETFONT` call to be successful.

### Output

The result type is `INTEGER ( 2 )`. The result is the number of fonts initialized

---

## SETFONT

*Finds a single font that matches a specified set of characteristics.*

---

### Prototype

```
INTERFACE  
    FUNCTION SETFONT ( OPTIONS )  
        INTEGER ( 2 ) SETFONT  
        CHARACTER ( LEN= * ) OPTIONS  
    END FUNCTION  
END INTERFACE
```

OPTIONS

Input. CHARACTER ( LEN= \* ). String describing font characteristics

**Description**

Finds a single font that matches a specified set of characteristics and makes it the current font used by the OUTGTEXT function. The SETFONT function searches the list of available fonts for a font matching the characteristics specified in OPTIONS. If a font matching the characteristics is found, it becomes the current font. The current font is used in all subsequent calls to the OUTGTEXT function. There can be only one current font.

The OPTIONS argument consists of letter codes, as follows, that describe the desired font. The OPTIONS parameter is not case sensitive or position sensitive.

t 'fontname'	Name of the desired typeface. It can be any installed font.
hy	Character height, where y is the number of pixels.
wx	Select character width, where x is the number of pixels.
f	Select only a fixed-space font (do not use with the p characteristic).
p	Select only a proportional-space font (do not use with the f characteristic).
v	Select only a vector-mapped font (do not use with the r characteristic). In Windows NT, Roman, Modern, and Script are examples of vector-mapped fonts, also called plotter fonts. True Type fonts (for example, Arial, Symbol, and Times New Roman) are not vector-mapped.
r	Select only a raster-mapped (bitmapped) font (do not use with the v characteristic). In Windows NT, Courier, Helvetica, and Palatino are examples of raster-mapped fonts, also called screen fonts. True Type fonts are not raster-mapped.
e	Select the bold text format. This parameter is ignored if the font does not allow the bold format.

<code>u</code>	Select the underline text format. This parameter is ignored if the font does not allow underlining.
<code>i</code>	Select the italic text format. This parameter is ignored if the font does not allow italics.
<code>b</code>	Select the font that best fits the other parameters specified.
<code>nx</code>	Select font number <code>x</code> , where <code>x</code> is less than or equal to the value returned by the <code>INITIALIZEFONTS</code> function.

You can specify as many options as you want, except with `nx`, which should be used alone. If you specify options that are mutually exclusive (such as the pairs `f/p` or `r/v`), the `SETFONT` function ignores them. There is no error detection for incompatible parameters used with `nx`.

If the `b` option is specified and at least one font is initialized, `SETFONT` sets a font and returns 0 to indicate success.

In selecting a font, the `SETFONT` routine uses the following criteria, rated from highest precedence to lowest:

- Pixel height
- Typeface
- Pixel width
- Fixed or proportional font

You can also specify a pixel width and height for fonts. If you choose a nonexistent value for either and specify the `b` option, `SETFONT` chooses the closest match.

A smaller font size has precedence over a larger size. If you request Arial 12 with best fit, and only Arial 10 and Arial 14 are available, `SETFONT` selects Arial 10.

If you choose a nonexistent value for pixel height and width, the `SETFONT` function applies a magnification factor to a vector-mapped font to obtain a suitable font size. This automatic magnification does not apply if you specify the `r` option (raster-mapped font), or if you request a specific typeface and do not specify the `b` option (best-fit).

If you specify the `nx` parameter, `SETFONT` ignores any other specified options and supplies only the font number corresponding to `x`.

If a height is given, but not a width, or vice versa, SETFONT computes the missing value to preserve the correct font proportions.

The font functions affect only OUTGTEXT and the current graphics position; no other Fortran Graphics Library output functions are affected by font usage.

For each window you open, you must call INITIALIZEFONTS before calling SETFONT. INITIALIZEFONTS needs to be executed after each new child window is opened in order for a subsequent SETFONT call to be successful.

### Output

The result type is INTEGER ( 2 ). The result is the index number (*x* as used in the *nx* option) of the font if successful; otherwise, - 1.

---

## SETGTEXTROTATION

*Sets the orientation angle of the font text output in degrees.*

---

### Prototype

```
INTERFACE
  SUBROUTINE SETGTEXTROTATION ( DEGREES )
    INTEGER ( 4 ) DEGREES
  END SUBROUTINE
END INTERFACE
```

DEGREES      Input. INTEGER ( 4 ). Angle of orientation, in tenths of degrees, of the font text output.

### Description

Sets the orientation angle of the font text output in degrees. The current orientation is used in calls to OUTGTEXT. The orientation of the font text output is set in tenths of degrees. Horizontal is 0°, and angles increase counterclockwise so that 900 (90°) is straight up, 1800 (180°) is upside down and left, 2700 (270°) is straight down, and so forth. If the user specifies a value greater than 3600 (360°), the subroutine takes a value equal to:

MODULO (user-specified tenths of degrees, 3600)

Although SETGTEXTROTATION accepts arguments in tenths of degrees, only increments of one full degree differ visually from each other on the screen.

---

## GETGTEXTROTATION

*Returns the current orientation of the font text output by OUTGTEXT.*

---

### Prototype

```
INTERFACE
  FUNCTION GETGTEXTROTATION( )
    INTEGER(4) GETGTEXTROTATION
  END FUNCTION
END INTERFACE
```

### Description

The orientation for text output with OUTGTEXT is set with SETGTEXTROTATION.

## Output

The result type is `INTEGER( 4 )`. It is the current orientation of the font text output in tenths of degrees. Horizontal is 0°, and angles increase counterclockwise so that 900 tenths of degrees (90°) is straight up, 1800 tenths of degrees (180°) is upside-down and left, 2700 tenths of degrees (270°) is straight down, and so forth.

---

## GETTEXTCOLORRGB

*Gets the Red-Green-Blue (RGB) value of the current text color.*

---

## Prototype

```
INTERFACE
  FUNCTION GETTEXTCOLORRGB( )
    INTEGER( 4 ) GETTEXTCOLORRGB
  END FUNCTION
END INTERFACE
```

## Description

Gets the Red-Green-Blue (RGB) value of the current text color (used with `OUTTEXT`, `WRITE` and `PRINT`). In each RGB color value, each of the three colors, red, green, and blue, is represented by an eight-bit value (2 hex digits). In the value you retrieve with `GETTEXTCOLORRGB`, red is the rightmost byte, followed by green and blue. The RGB value's internal structure is as follows:

Larger numbers correspond to stronger color intensity with binary (hex FF) the maximum for each of the three components. For example, #0000FF yields full-intensity red, #00FF00 full-intensity green, #FF0000 full-intensity blue, and #FFFFFF full-intensity for all three, resulting in bright white.

`GETTEXTCOLORRGB` returns the RGB color value of text over the background color (used by text functions such as `OUTTEXT`, `WRITE`, and `PRINT`), set with `SETTEXTCOLORRGB`. The RGB color value used for

graphics is set and returned with SETCOLORRGB and GETCOLORRGB. SETCOLORRGB controls the color used by the graphics function OUTGTEXT, while SETTEXTCOLORRGB controls the color used by all other text output functions. The RGB background color value for both text and graphics is set and returned with SETBKCOLORRGB and GETBKCOLORRGB. SETTEXTCOLORRGB (and the other RGB color selection functions SETBKCOLORRGB, and SETCOLORRGB) sets the color to a color value chosen from the entire available range. The non-RGB color functions (SETTEXTCOLOR, SETBKCOLOR, and SETCOLOR) use color indexes rather than true color values. If you use color indexes, you are limited to the colors available in the palette, at most 256. Some display adapters (SVGA and true color) are capable of creating 262,144 (256K) colors or more. To access any available color, you need to specify an explicit RGB value with an RGB color function, rather than a palette index with a non-RGB color function.

### Output

The result type is INTEGER ( 4 ). It is the RGB value of the current text color.

---

## SETTEXTCOLORRGB

*Sets the current text color to the specified Red-Green-Blue (RGB) value.*

---

### Prototype

```
INTERFACE
  FUNCTION SETTEXTCOLORRGB ( COLOR )
    INTEGER ( 4 ) SETTEXTCOLORRGB, COLOR
  END FUNCTION
END INTERFACE
```

COLOR            Input. INTEGER ( 4 ). RGB color value to set the text color to. Range and result depend on the system's display adapter.

## Description

In each RGB color value, each of the three colors, red, green, and blue, is represented by an eight-bit value (2 hex digits). In the value you specify with `SETTEXTCOLORRGB`, red is the rightmost byte, followed by green and blue. The RGB value's internal structure is as follows:

Larger numbers correspond to stronger color intensity with binary 1111111 (hex FF) the maximum for each of the three components. For example, #0000FF yields full-intensity red, #00FF00 full-intensity green, #FF0000 full-intensity blue, and #FFFFFF full-intensity for all three, resulting in bright white.

`SETTEXTCOLORRGB` sets the current text RGB color. The default value is #00FFFFFF, which is full-intensity white. `SETTEXTCOLORRGB` sets the color used by `OUTTEXT`, `WRITE`, and `PRINT`. It does not affect the color of text output with the `OUTGTEXT` font routine. Use `SETCOLORRGB` to change the color of font output.

`SETBKCOLORRGB` sets the RGB color value of the current background for both text and graphics. `SETCOLORRGB` sets the RGB color value of graphics over the background color, used by the graphics functions such as `ARC`, `FLOODFILLRGB`, and `OUTGTEXT`.

`SETTEXTCOLORRGB` (and the other RGB color selection functions `SETBKCOLORRGB` and `SETCOLORRGB`) sets the color to a value chosen from the entire available range. The non-RGB color functions (`SETTEXTCOLOR`, `SETBKCOLOR`, and `SETCOLOR`) use color indexes rather than true color values.

If you use color indexes, you are limited to the colors available in the palette, at most 256. Some display adapters (SVGA and true color) are capable of creating 262,144 (256K) colors or more. To access any available color, you need to specify an explicit RGB value with an RGB color function, rather than a palette index with a non-RGB color function.

## Output

The result type is `INTEGER(4)`. The result is the previous text RGB color value.



---

## QuickWin Compatible Support

---

### ABOUTBOXQQ

*Specifies the message box information that appears when About command from a Help menu is selected.*

---

#### Prototype

```
INTERFACE
    FUNCTION ABOUTBOXQQ ( STR )
        INTEGER ( 4 ) ABOUTBOXQQ
        CHARACTER ( LEN= * ) STR
    END FUNCTION
END INTERFACE
```

STR                      Input; output. CHARACTER ( LEN= \* ). Null-terminated C string.

#### Description

Specifies the information displayed in the message box that appears when the About command from a QuickWin application's Help menu is selected. If your program does not call ABOUTBOXQQ, the QuickWin run-time library supplies a default string.

#### Output

The value of the result is INTEGER ( 4 ). It is zero if successful; otherwise, nonzero.

---

## APPENDMENUQQ

*Appends a menu item to the end of a menu and registers its callback subroutine.*

---

### Prototype

```
INTERFACE
```

```
    FUNCTION APPENDMENUQQ (MENUID, FLAGS, TEXT, ROUTINE)
```

```
        LOGICAL APPENDMENUQQ
```

```
        INTEGER (4) MENUID, FLAGS
```

```
        CHARACTER (LEN=*) TEXT
```

```
        EXTERNAL ROUTINE
```

```
    END FUNCTION
```

```
END INTERFACE
```

**MENUID**            Input. INTEGER ( 4 ). Identifies the menu to which the item is appended, starting with 1 as the leftmost menu.

**FLAGS**            Input. INTEGER ( 4 ). Constant indicating the menu state. Flags can be combined with an inclusive **OR**. The following constants are available:

\$MENUGRAYED	Disables and grays out the menu item.
\$MENUDISABLED	Disables but does not gray out the menu item.
\$MENUENABLED	Enables the menu item.
\$MENUSEPARATOR	Draws a separator bar.
\$MENUCHECKED	Puts a check by the menu item.
\$MENUUNCHECKED	Removes the check by the menu item.

TEXT	Input. CHARACTER ( LEN= * ) . Menu item name. Must be a null-terminated C string, for example, 'WORDS OF TEXT'.
ROUTINE	Input. EXTERNAL. Callback subroutine that is called if the menu item is selected. All routines take a single LOGICAL parameter which indicates whether the menu item is checked or not. You can assign the following predefined routines to menus:
WINPRINT	Prints the program.
WINSAVE	Saves the program.
WINEXIT	Terminates the program.
WINSELTEXT	Selects text from the current window.
WINSELGRAPH	Selects graphics from the current window.
WINSELALL	Selects the entire contents of the current window.
WINCOPY	Copies the selected text and/or graphics from the current window to the Clipboard.
WINPASTE	Allows the user to paste Clipboard contents (text only) to the current text window of the active window during a READ.
WINCLEARPASTE	Clears the paste buffer.
WINSIZETO FIT	Sizes output to fit window.
WINFULLSCREEN	Displays output in full screen.
WINSTATE	Toggles between pause and resume states of text output.
WINCASCADE	Cascades active windows.
WINTILE	Tiles active windows.
WINARRANGE	Arranges icons.

WINSTATUS	Enables a status bar.
WININDEX	Displays the index for QuickWin help.
WINUSING	Displays information on how to use Help.
WINABOUT	Displays information about the current QuickWin application.
NUL	No callback routine.

### Description

You do not need to specify a menu item number, because APPENDMENUQQ always adds the new item to the bottom of the menu list. If there is no item yet for a menu, your appended item is treated as the top-level menu item (shown on the menu bar), and TEXT becomes the menu title.

APPENDMENUQQ ignores the callback routine for a top-level menu item if there are any other menu items in the menu. In this case, you can set ROUTINE to NUL.

If you want to insert a menu item into a menu rather than append to the bottom of the menu list, use INSERTMENUQQ.

The constants available for flags can be combined with an inclusive OR where reasonable, for example \$MENUMCHECKED .OR. \$MENUENABLED. Some combinations do not make sense, such as \$MENUENABLED and \$MENUDISABLED, and lead to undefined behavior.

You can create quick-access keys in the text strings you pass to APPENDMENUQQ as TEXT by placing an ampersand (&) before the letter you want underlined. For example, to add a Print menu item with the R underlined, TEXT should be "P&rint". Quick-access keys allow users of your program to activate that menu item with the key combination ALT+QUICK-ACCESS-KEY (ALT+R in the example) as an alternative to selecting the item with the mouse.

### Output

The result type is LOGICAL: .TRUE. if successful; otherwise, .FALSE..

---

## CLICKMENUQQ

*Simulates the effect of clicking or selecting a menu command.*

---

### Prototype

```
INTERFACE
  FUNCTION CLICKMENUQQ ( ITEM )
    INTEGER ( 4 ) CLICKMENUQQ , ITEM
  END FUNCTION
END INTERFACE
```

ITEM            Input. INTEGER ( 4 ) . Constant that represents the command selected from the Window menu. Must be one of the following symbolic constants:

QWIN\$STATUS	Status command
QWIN\$TILE	Tile command
QWIN\$CASCADE	Cascade command
QWIN\$ARRANGE	Arrange Icons command

### Description

Simulates the effect of clicking or selecting a menu command. The QuickWin application responds as though the user had clicked or selected the command.

### Output

The result type is INTEGER ( 4 ) . The result is zero if successful; otherwise, nonzero.

---

## DELETEMENUQQ

*Deletes a menu item from a QuickWin menu.*

---

### Prototype

```
INTERFACE
  FUNCTION DELETEMENUQQ (MENUID, ITEMID)
    LOGICAL DELETEMENUQQ
    INTEGER (4) MENUID, ITEMID
  END FUNCTION
END INTERFACE
```

MENUID	Input. <code>INTEGER (4)</code> . Identifies the menu that contains the menu item to be deleted, starting with 1 as the leftmost menu.
ITEMID	Input. <code>INTEGER (4)</code> . Identifies the menu item to be deleted, starting with 0 as the top menu item.

### Description

Deletes a menu item from a QuickWin menu.

### Output

The result type is `LOGICAL (4)`. The result is `.TRUE.` if successful; otherwise, `.FALSE.`

---

## FOCUSQQ

*Sets focus to the window with the specified unit number.*

---

### Prototype

```
INTERFACE
  FUNCTION FOCUSQQ( IUNIT )
    INTEGER(4) FOCUSQQ, IUNIT
  END FUNCTION
END INTERFACE
```

IUNIT            Input. INTEGER(4). Unit number of the window to which the focus is set. Unit numbers 0, 5, and 6 refer to the default startup window.

### Description

Units 0, 5, and 6 refer to the default window only if the program does not specifically open them. If these units have been opened and connected to windows, they are automatically reconnected to the console once they are closed.

Unlike SETACTIVEQQ, FOCUSQQ brings the specified unit to the foreground. Note that the window with the focus is not necessarily the active window (the one that receives graphical output). A window can be made active without getting the focus by calling SETACTIVEQQ.

A window has focus when it is given the focus by FOCUSQQ, when it is selected by a mouse click, or when an I/O operation other than a graphics operation is performed on it, unless the window was opened with IOFOCUS=.FALSE.. The IOFOCUS specifier determines whether a window receives focus when an I/O statement is executed on that unit. For example:

```
OPEN (UNIT = 10, FILE = 'USER', IOFOCUS = .TRUE.)
```

By default `IOFOCUS = .TRUE.`, except for child windows opened with `as unit *`. If `IOFOCUS = .TRUE.`, the child window receives focus prior to each `READ`, `WRITE`, `PRINT`, or `OUTTEXT`. Calls to graphics functions (such as `OUTGTEXT` and `ARC`) do not cause the focus to shift.

### Output

The result type is `INTEGER(4)`. The result is zero if successful; otherwise, nonzero.

---

## GETACTIVEQQ

*Returns the unit number of the currently active child window.*

---

### Prototype

```
INTERFACE
  FUNCTION GETACTIVEQQ( )
    INTEGER(4) GETACTIVEQQ
  END FUNCTION
END INTERFACE
```

### Description

This function returns the unit number of the currently active child window.

### Output

The result type is `INTEGER(4)`. The result is the unit number of the currently active window. Returns the parameter `QWIN$NOACTIVEWINDOW` if no child window is active.



---

## GETEXITQQ

*Gets the setting for a QuickWin application's exit behavior.*

---

### Prototype

```
INTERFACE
  FUNCTION GETEXITQQ ( )
    INTEGER ( 4 ) GETEXITQQ
  END FUNCTION
END INTERFACE
```

### Description

This function gets the setting for a QuickWin application's exit behavior.

### Output

The result type is `INTEGER ( 4 )`. The result is exit mode with one of the following constants:

<code>QWIN\$EXITPROMPT</code>	Displays a message box that reads "Program exited with exit status <i>n</i> . Exit Window?", where <i>n</i> is the exit status from the program. If the user chooses Yes, the application closes the window and terminates. If the user chooses No, the dialog box disappears and the user can manipulate the window as usual. The user must then close the window manually.
<code>QWIN\$EXITNOPERSIST</code>	Terminates the application without displaying a message box.
<code>QWIN\$EXITPERSIST</code>	Leaves the application open without displaying a message box.

The default for both QuickWin and Console Graphics applications is QWIN\$EXITPROMPT.

---

## GETHWNDQQ

*Converts a window unit number into a Windows handle.*

---

### Prototype

```
INTERFACE
  FUNCTION GETHWNDQQ(IUNIT)
    INTEGER(4) GETHWNDQQ, IUNIT
  END FUNCTION
END INTERFACE
```

IUNIT            Input. INTEGER( 4 ). Window unit number. If IUNIT is set to QWIN\$FRAMEWINDOW, the handle of the frame window is returned.

### Description

This function converts a window unit number into a Windows handle.

### Output

The result type is INTEGER( 4 ). The result is a true Windows handle to the window. It returns -1 if IUNIT is not open.

---

## GETUNITQQ

*Returns the unit number corresponding to the specified Windows handle.*

---

### Prototype

```
INTERFACE
  FUNCTION GETUNITQQ ( IHANDLE )
    INTEGER ( 4 ) GETUNITQQ , IHANDLE
  END FUNCTION
END INTERFACE

IHANDLE      Input. INTEGER ( 4 ) . The Windows handle to the
              window; this is a unique ID.
```

### Description

Returns the unit number corresponding to the specified Windows handle. This routine is the inverse of GETHWNDQQ.

### Output

The result type is INTEGER ( 4 ) . The result is the unit number corresponding to the specified Windows handle. It returns -1 if IHANDLE does not exist.

---

## GETWINDOWCONFIG

*Gets the properties of the current window.*

---

### Prototype

```
INTERFACE
  FUNCTION GETWINDOWCONFIG ( WC )
```

```

LOGICAL GETWINDOWCONFIG
STRUCTURE /WINDOWCONFIG/
  INTEGER(2) NUMXPIXELS, NUMYPIXELS
  INTEGER(2) NUMTEXTCOLS, NUMTEXTROWS
  INTEGER(2) NUMCOLORS
  INTEGER(2) FONTSIZE
  CHARACTER(LEN=80) TITLE
  INTEGER(2) BITSPERPIXEL
  INTEGER(2) NUMVIDEOPAGES
  INTEGER(2) MODE
  INTEGER(2) ADAPTER
  INTEGER(2) MONITOR
  INTEGER(2) MEMORY
  INTEGER(2) ENVIRONMENT
  CHARACTER(LEN=32) EXTENDFONTNAME
  INTEGER(4) EXTENDFONTSIZE
  INTEGER(4) EXTENDFONTATTRIBUTES
END STRUCTURE
RECORD /WINDOWCONFIG/WC
END FUNCTION
END INTERFACE

WC          Output. Derived type windowconfig. Contains window
           properties.

TYPE WINDOWCONFIG
  INTEGER(2) NUMXPIXELS      ! Number of pixels on x-axis
  INTEGER(2) NUMYPIXELS      ! Number of pixels on y-axis
  INTEGER(2) NUMTEXTCOLS     ! Number of text columns
                           ! available
  INTEGER(2) NUMTEXTROWS     ! Number of text rows
                           ! available
  INTEGER(2) NUMCOLORS       ! Number of color indexes
  INTEGER(4) FONTSIZE        ! Size of default font. Set
                           ! to QWIN$EXTENDFONT when using
                           ! multibyte characters, in which case

```

```
        ! EXTENFSIZE sets the font size.
CHARACTER(LEN=80) title    ! window title
INTEGER(2) BITSPIXEL      ! number of bits per pixel
! The next three parameters support multibyte
! character sets (such as Japanese)
CHARACTER(LEN=32) EXTENDFONTNAME ! any
! nonproportionally spaced font available on the
! system
INTEGER(4) EXTENFSIZE ! takes same values as
        ! FONTSIZE, but used for multibyte
        ! character sets when FONTSIZE set to
        ! QWIN$EXTENDFONT
INTEGER(4) EXTENDFONTATTRIBUTES ! font attributes
        ! such as bold and italic for
        ! multibyte character sets
END TYPE WINDOWCONFIG
```

## Description

GETWINDOWCONFIG returns information about the active child window. If you have not set the window properties with SETWINDOWCONFIG, GETWINDOWCONFIG returns default window values.

A typical set of values would be 1024 x pixels, 768 y pixels, 128 text columns, 48 text rows, and a font size of 8x16 pixels. The resolution of the display and the assumed font size of 8x16 pixels generates the number of text rows and text columns. The resolution (in this case, 1024 x pixels by 768 y pixels) is the size of the *virtual* window. To get the size of the *physical* window visible on the screen, use GETWSIZEQQ. In this case, GETWSIZEQQ returned the following values: (0,0) for the x and y position of the physical window, 25 for the height or number of rows, and 71 for the width or number of columns.

The number of colors returned depends on the video drive. The window title defaults to "Graphic1" for the default window. All of these values can be changed with SETWINDOWCONFIG.

Note that the `bitsperpixel` field in the `windowconfig` derived type is an output field only, while the other fields return output values to `GETWINDOWCONFIG` and accept input values from `SETWINDOWCONFIG`.

### Output

The result type is `LOGICAL(4)`. The result is `.TRUE.` if successful; otherwise, `.FALSE.` (for example, if there is no active child window).

---

## GETWSIZEQQ

*Gets the size and position of a window.*

---

### Prototype

```

INTERFACE
  FUNCTION GETWSIZEQQ(IUNIT,IREQ,WINFO)
    structure /QWINFO/
      INTEGER(2) TYPE,X,Y,H,W
    END STRUCTURE
    INTEGER(4) GETWSIZEQQ,IUNIT
    INTEGER(4) IREQ
    RECORD /QWINFO/ WINFO
  END FUNCTION
END INTERFACE

IUNIT      Input. INTEGER(4). Specifies the window unit. Unit
            numbers 0, 5 and 6 refer to the default startup window
            only if you have not explicitly opened them with the
            OPEN statement. To access information about the frame
            window (as opposed to a child window), set unit to the
            symbolic constant QWIN$FRAMEWINDOW.

IREQ       Input. INTEGER(4). Specifies what information is
            obtained.
```

```

                                QWIN$SIZEMAX    Gets information about the
                                                maximum window size.

                                QWIN$SIZECURR    Gets information about the current
                                                window size.

WINFO                           Output. Derived type qwinfo. Physical coordinates of
                                the window's upper-left corner, and the current or
                                maximum height and width of the window's client area
                                (the area within the frame).

TYPE QWINFO
    INTEGER(2) TYPE      ! request type (controls
                        ! SETWSIZEQQ)

    INTEGER(2) X         ! x coordinate for upper left
    INTEGER(2) Y         ! y coordinate for upper left
    INTEGER(2) H         ! window height
    INTEGER(2) W         ! window width
END TYPE QWINFO

```

## Description

The position and dimensions of child windows are expressed in units of character height and width. The position and dimensions of the frame window are expressed in screen pixels.

The height and width returned for a frame window reflects the size in pixels of the client area *excluding* any borders, menus, and status bar at the bottom of the frame window. You should adjust the values used in `SETWSIZEQQ` to take this into account.

The client area is the area actually available to place child windows.

## Output

The result type is `INTEGER(4)`. The result is zero if successful; otherwise, nonzero.

---

## INQFOCUSQQ

*Determines which window has the focus.*

---

### Prototype

```
INTERFACE
  FUNCTION INQFOCUSQQ( IUNIT )
    INTEGER( 4 ) INQFOCUSQQ, IUNIT
  END FUNCTION
END INTERFACE
```

IUNIT                    Output. INTEGER( 4 ). Unit number of the window that has the I/O focus.

### Description

Unit numbers 0, 5, and 6 refer to the default window only if the program has not specifically opened them. If these units have been opened and connected to windows, they are automatically reconnected to the console once they are closed.

The window with focus is always in the foreground. Note that the window with the focus is not necessarily the active window (the one that receives graphical output). A window can be made active without getting the focus by calling SETACTIVEQQ.

A window has focus when it is given the focus by FOCUSQQ, when it is selected by a mouse click, or when an I/O operation other than a graphics operation is performed on it, unless the window was opened with IOFOCUS=.FALSE.. The IOFOCUS specifier determines whether a window receives focus when an I/O statement is executed on that unit. For example:

```
OPEN (UNIT = 10, FILE = 'USER', IOFOCUS = .TRUE.)
```



By default IOFOCUS= .TRUE. , except for child windows opened with as unit \*. If IOFOCUS= .TRUE. , the child window receives focus prior to each READ, WRITE, PRINT, or OUTTEXT. Calls to graphics functions (such as OUTGTEXT and ARC) do not cause the focus to shift.

### Output

The result type is INTEGER ( 4 ) . The result is zero if successful; otherwise, nonzero. The function fails if the window with the focus is associated with a closed unit.

---

## INSERTMENUQQ

*Inserts a menu item into a QuickWin menu and registers its callback routine.*

---

### Prototype

INTERFACE

FUNCTION

INSERTMENUQQ ( MENUID , ITEMID , FLGS , TEXT , ROUTINE )

LOGICAL INSERTMENUQQ

INTEGER ( 4 ) MENUID , ITEMID , FLAGS

CHARACTER ( LEN= \* ) TEXT

EXTERNAL ROUTINE

END FUNCTION

END INTERFACE

MENUID	Input. INTEGER ( 4 ) . Identifies the menu in which the item is inserted, starting with 1 as the leftmost menu.
ITEMID	Input. INTEGER ( 4 ) . Identifies the position in the menu where the item is inserted, starting with 0 as the top menu item.

**FLAGS**

Input. `INTEGER ( 4 )`. Constant indicating the menu state. Flags can be combined with an inclusive OR (see Results section below). The following constants are available:

<code>\$MENUGRAYED</code>	Disables and grays out the menu item.
<code>\$MENUDISABLED</code>	Disables but does not gray out the menu item.
<code>\$MENUENABLED</code>	Enables the menu item.
<code>\$MENUSEPARATOR</code>	Draws a separator bar.
<code>\$MENCHECKED</code>	Puts a check by the menu item.
<code>\$MENUUNCHECKED</code>	Removes the check by the menu item.

**TEXT**

Input. `CHARACTER ( LEN= * )`. Menu item name. Must be a null-terminated C string, for example, words of text'C.

**ROUTINE**

Input. `EXTERNAL`. Callback subroutine that is called if the menu item is selected. All routines must take a single `LOGICAL` parameter which indicates whether the menu item is checked or not. You can assign the following predefined routines to menus:

<code>WINPRINT</code>	Prints the program.
<code>WINSAVE</code>	Saves the program.
<code>WINEXIT</code>	Terminates the program.
<code>WINSELTEXT</code>	Selects text from the current window.
<code>WINSELGRAPH</code>	Selects graphics from the current window.
<code>WINSELALL</code>	Selects the entire contents of the current window.
<code>WINCOPY</code>	Copies the selected text and/or graphics from current window to the Clipboard.

WINPASTE	Allows the user to paste Clipboard contents (text only) to the current text window of the active window during a READ.
WINCLEARPASTE	Clears the paste buffer.
WINSIZETO FIT	Sizes output to fit window.
WINFULLSCREEN	Displays output in full screen.
WINSTATE	Toggles between pause and resume states of text output.
WINCASCADE	Cascades active windows.
WINTILE	Tiles active windows.
WINARRANGE	Arranges icons.
WINSTATUS	Enables a status bar.
WININDEX	Displays the index for QuickWin help.
WINUSING	Displays information on how to use Help.
WINABOUT	Displays information about the current QuickWin application.
NUL	No callback routine.

## Description

Menus and menu items must be defined in order from left to right and top to bottom. For example, INSERTMENUQQ fails if you try to insert menu item 7 when 5 and 6 are not defined yet. For a top-level menu item, the callback routine is ignored if there are subitems under it.

The constants available for flags can be combined with an inclusive OR where reasonable, for example \$MENUMCHECKED .OR. \$MENUENABLED. Some combinations do not make sense, such as \$MENUENABLED and \$MENUDISABLED, and lead to undefined behavior.

You can create quick-access keys in the text strings you pass to INSERTMENUQQ as *text* by placing an ampersand (&) before the letter you want underlined. For example, to add a Print menu item with the r

underlined, *text* should be "P&rint". Quick-access keys allow users of your program to activate that menu item with the key combination ALT+QUICK-ACCESS-KEY (ALT+R in the example) as an alternative to selecting the item with the mouse.

### Output

The result type is LOGICAL ( 4 ). The result is .TRUE. if successful; otherwise, .FALSE..

---

## MESSAGEBOXQQ

*Displays a message box in a QuickWin window.*

---

### Prototype

```
INTERFACE
  FUNCTION MESSAGEBOXQQ (MSG, CAPTION, MTYPE)
    CHARACTER (LEN=*) MSG, CAPTION
    INTEGER (4) MESSAGEBOXQQ, MTYPE
  END FUNCTION
END INTERFACE
```

MSG	Input. CHARACTER ( LEN= * ). Null-terminated C string. Message the box displays.
CAPTION	Input. CHARACTER ( LEN= * ). Null-terminated C string. Caption that appears in the title bar.
MTYPE	Input. INTEGER ( 4 ). Symbolic constant that determines the objects (buttons and icons) and attributes of the message box. You can combine several constants using an inclusive OR (IOR or OR). The symbolic constants and their associated objects or attributes are:  MB\$ABORTRETRYIGNORE The Abort, Retry, and Ignore buttons.

MB\$DEFBUTTON1	The first button is the default.
MB\$DEFBUTTON2	The second button is the default.
MB\$DEFBUTTON3	The third button is the default.
MB\$ICONASTERISK	Lowercase <i>i</i> in blue circle icon.
MB\$ICONEXCLAMATION	The exclamation-mark icon.
MB\$ICONHAND	The stop-sign icon.
MB\$ICONINFORMATION	Lowercase <i>i</i> in blue circle icon.
MB\$ICONQUESTION	The question-mark icon.
MB\$ICONSTOP	The stop-sign icon.
MB\$OK	The OK button.
MB\$OKCANCEL	The OK and Cancel buttons.
MB\$RETRYCANCEL	The Retry and Cancel buttons.
MB\$SYSTEMMODAL	Box is system-modal: all applications are suspended until the user responds.
MB\$YESNO	The Yes and No buttons.
MB\$YESNOCANCEL	The Yes, No, and Cancel buttons.

## Description

This function displays a message box in a QuickWin window.

## Output

The result type is INTEGER(4). The result is zero if memory is not sufficient for displaying the message box. Otherwise, the result is one of the following values, indicating the user's response to the message box:

MB\$IDABORT	The Abort button was pressed.
MB\$IDCANCEL	The Cancel button was pressed.
MB\$IDIGNORE	The Ignore button was pressed.
MB\$IDNO	The No button was pressed.
MB\$IDOK	The OK button was pressed.
MB\$IDRETRY	The Retry button was pressed.
MB\$IDYES	The Yes button was pressed.

---

## MODIFYMENUFLAGSQQ

*Modifies a menu item's state.*

---

### Prototype

```
INTERFACE
```

```
  FUNCTION MODIFYMENUFLAGSQQ ( MENUID , ITEMID , FLAGS )
```

```
    LOGICAL MODIFYMENUFLAGSQQ
```

```
    INTEGER ( 4 ) MENUID , ITEMID , FLAGS
```

```
  END FUNCTION
```

```
END INTERFACE
```

MENUID	Input. INTEGER ( 4 ) . Identifies the menu containing the item whose state is to be modified, starting with 1 as the leftmost menu.		
ITEMID	Input. INTEGER ( 4 ) . Identifies the menu item whose state is to be modified, starting with 0 as the top item.		
FLAGS	Input. INTEGER ( 4 ) . Constant indicating the menu state. Flags can be combined with an inclusive OR. The following constants are available: <table> <tr> <td>\$MENUGRAYED</td><td>Disables and grays out the menu item.</td></tr> </table>	\$MENUGRAYED	Disables and grays out the menu item.
\$MENUGRAYED	Disables and grays out the menu item.		

<code>\$MENUDISABLED</code>	Disables but does not gray out the menu item.
<code>\$MENUENABLED</code>	Enables the menu item.
<code>\$MENUSEPARATOR</code>	Draws a separator bar.
<code>\$MENUCHECKED</code>	Puts a check by the menu item.
<code>\$MENUUNCHECKED</code>	Removes the check by the menu item.

### Description

The constants available for flags can be combined with an inclusive OR where reasonable, for example `$MENUCHECKED .OR. $MENUENABLED`. Some combinations do not make sense, such as `$MENUENABLED` and `$MENUDISABLED`, and lead to undefined behavior.

### Output

The result type is `LOGICAL(4)`. The result is `.TRUE.` if successful; otherwise, `.FALSE.`

---

## MODIFYMENUROUTINEQQ

*Changes a menu item's callback routine.*

---

### Prototype

```
INTERFACE
  FUNCTION MODIFYMENUROUTINEQQ(MENUID, ITENID, ROUTINE)
    LOGICAL MODIFYMENUROUTINEQQ
    INTEGER(4) MENUID, ITEMID
    EXTERNAL ROUTINE
  END FUNCTION
END INTERFACE
```

MENUID	Input. <code>INTEGER ( 4 )</code> . Identifies the menu that contains the item whose callback routine is to be changed, starting with 1 as the leftmost menu.
ITEMID	Input. <code>INTEGER ( 4 )</code> . Identifies the menu item whose callback routine is to be changed, starting with 0 as the top item.
ROUTINE	Input. <code>EXTERNAL</code> . Callback subroutine called if the menu item is selected. All routines must take a single <code>LOGICAL</code> parameter that indicates whether the menu item is checked or not. The following predefined routines are available for assigning to menus:
WINPRINT	Prints the program.
WINSAVE	Saves the program.
WINEXIT	Terminates the program.
WINSELTEXT	Selects text from the current window.
WINSELGRAPH	Selects graphics from the current window.
WINSELALL	Selects the entire contents of the current window.
WINCOPY	Copies the selected text and/or graphics from the current window to the Clipboard.
WINPASTE	Allows the user to paste Clipboard contents (text only) to the current text window of the active window during a <code>READ</code> .
WINCLEARPASTE	Clears the paste buffer.
WINSIZETO FIT	Sizes output to fit window.
WINFULLSCREEN	Displays output in full screen.
WINSTATE	Toggles between pause and resume states of text output.



WINCASCADE	Cascades active windows.
WINTILE	Tiles active windows.
WINARRANGE	Arranges icons.
WINSTATUS	Enables a status bar.
WININDEX	Displays the index for QuickWin Help.
WINUSING	Displays information on Help.
WINABOUT	Displays information about the current QuickWin application.
NUL	No callback routine.

### Description

This function changes a menu item's callback routine.

### Output

The result type is LOGICAL ( 4 ). The result is .TRUE. if successful; otherwise, .FALSE..

---

## MODIFYMENUSTRINGQQ

*Changes a menu item's text string.*

---

### Prototype

```
INTERFACE
  FUNCTION MODIFYMENUSTRINGQQ ( MENUID , ITEMID , TEXT )
    LOGICAL MODIFYMENUSTRINGQQ
    INTEGER ( 4 ) MENUID , ITEMID
    CHARACTER ( LEN = * ) TEXT
  END FUNCTION
END INTERFACE
```

<code>MENUID</code>	Input. <code>INTEGER ( 4 )</code> . Identifies the menu containing the item whose text string is to be changed, starting with 1 as the leftmost item.
<code>ITEMID</code>	Input. <code>INTEGER ( 4 )</code> . Identifies the menu item whose text string is to be changed, starting with 0 as the top menu item.
<code>TEXT</code>	Input. <code>CHARACTER ( LEN= * )</code> . Menu item name. Must be a null-terminated C string. For example, words of text'C.

### Description

You can add access keys in your text strings by placing an ampersand (&) before the letter you want underlined. For example, to add a Print menu item with the `r` underlined, use "P&rint"C as `TEXT`.

### Output

The result type is `LOGICAL ( 4 )`. The result is `.TRUE.` if successful; otherwise, `.FALSE.`

---

## REGISTERMOUSEEVENT

*Registers the application-supplied callback routine to be called when a specified mouse event occurs in a specified window.*

---

### Prototype

```

INTERFACE
  FUNCTION
    REGISTERMOUSEEVENT(UNIT,MouseEvents,CallBackRoutine)
      INTEGER REGISTERMOUSEEVENT,UNIT
      INTEGER MouseEvents

```

```

EXTERNAL CallBackRoutine
END FUNCTION
END INTERFACE
UNIT      Input. INTEGER ( 4 ) . Unit number of the window whose
          callback routine on mouse events is to be registered.
MOUSEEVENTS  Input. INTEGER ( 4 ) . One or more mouse events to be
          handled by the callback routine to be registered.
          Symbolic constants for the possible mouse events are:
          MOUSE$LBUTTONDOWN
                  Left mouse button down
          MOUSE$LBUTTONUP
                  Left mouse button up
          MOUSE$LBUTTONDBLCLK
                  Left mouse button double-click
          MOUSE$RBUTTONDOWN
                  Right mouse button down
          MOUSE$RBUTTONUP
                  Right mouse button up
          MOUSE$RBUTTONDBLCLK
                  Right mouse button double-click
          MOUSE$MOVE   Mouse moved
CALLBACKROUTINE
          Input. EXTERNAL. Routine to be called
          on specified mouse event in the
          specified window.

```

## Description

Registers the application-supplied callback routine to be called when a specified mouse event occurs in a specified window. For every BUTTONDOWN or BUTTONDBLCLK event there is an associated BUTTONUP event. When the user double clicks, four events happen: BUTTONDOWN and BUTTONUP for the first click, and BUTTONDBLCLK and BUTTONUP for the second click. The difference between getting BUTTONDBLCLK and

BUTTONDOWN for the second click depends on whether the second click occurs in the double click interval, set in the system's CONTROL PANEL/MOUSE.

### Output

The result type is `INTEGER(4)`. The result is zero or a positive integer if successful; otherwise, a negative integer that can be one of the following:

`MOUSE$BADUNIT` The unit specified is not open, or is not associated with a QuickWin window.

`MOUSE$BADEVENT`  
The event specified is not supported.

---

## SETACTIVEQQ

*Makes a child window active, but does not give it focus.*

---

### Prototype

```
INTERFACE
  FUNCTION SETACTIVEQQ(UNIT)
    INTEGER(4) SETACTIVEQQ, UNIT
  END FUNCTION
END INTERFACE
```

`UNIT`                      Input. `INTEGER(4)`. Unit number of the child window to be made active.

### Description

When a window is made active, it receives graphics output (from ARC, LINETO and OUTGTEXT, for example) but is not brought to the foreground and does not have the focus. If a window needs to be brought to the foreground, it must be given the focus. A window is given focus with FOCUSQQ, by clicking it with the mouse, or by performing I/O other than

graphics on it, unless the window was opened with `IOFOCUS= ' .FALSE . '`. By default, `IOFOCUS= ' .TRUE . '`, except for child windows opened as unit `' * '`.

The window that has the focus is always on top, and all other windows have their title bars grayed out. A window can have the focus and yet not be active and not have graphics output directed to it. Graphical output is independent of focus.

If `IOFOCUS= ' .TRUE . '`, the child window receives focus prior to each `READ`, `WRITE`, `PRINT`, or `OUTTEXT`. Calls to graphics functions (such as `OUTGTEXT` and `ARC`) do not cause the focus to shift.

## Output

The result type is `INTEGER ( 4 )`. The result is 1 if successful; otherwise, 0.

---

# SETEXITQQ

*Sets a QuickWin application's exit behavior.*

---

## Prototype

```

INTERFACE
  FUNCTION SETEXITQQ ( EXITMODE )
    INTEGER ( 4 ) SETEXITQQ, EXITMODE
  END FUNCTION
END INTERFACE

EXITMODE      Input. INTEGER ( 4 ). Determines the program exit
               behavior. The following exit parameters:
               QWIN$EXITPROMPT
                 Displays the following message box:
                 "Program exited with exit status X. Exit
                 Window?" where X is the exit status from the
                 program. If Yes is entered, the application

```

closes the window and terminates. If `NO` is entered, the dialog box disappears and you can manipulate the windows as usual. You must then close the window manually.

`QWIN$EXITNOPERSIST`

Terminates the application without displaying a message box.

`QWIN$EXITPERSIST`

Leaves the application open without displaying a message box.

## Description

This function sets a QuickWin application's exit behavior.

## Output

The result type is `INTEGER(4)`. The result is zero if successful; otherwise, a negative value. The default for both QuickWin and Standard Graphics applications is `QWIN$EXITPROMPT`.

---

# SETMESSAGEQQ

*Changes QuickWin status messages, state messages, and dialog box messages.*

---

## Prototype

```
INTERFACE
  SUBROUTINE SETMESSAGEQQ(MSG, ID)
    CHARACTER(LEN=*) MSG
    INTEGER(4) ID
  END SUBROUTINE
END INTERFACE
```

**MSG**            Input. CHARACTER ( LEN= \* ) . Message to be displayed.  
Must be a regular Fortran string, not a C string. Can  
include multibyte characters.

**ID**            Input. INTEGER ( 4 ) . Identifier of the message to be  
changed. The following table shows the messages that  
can be changed and their identifiers:

<b>ID</b>	<b>Message</b>
QWIN\$MSG_TERM	"Program terminated with exit code"
QWIN\$MSG_EXITQ	"\nExit Window?"
QWIN\$MSG_FINISHED	"Finished"
QWIN\$MSG_PAUSED	"Paused"
QWIN\$MSG_RUNNING	"Running"
QWIN\$MSG_FILEOPENDLG	"Text Files(*.txt), *.txt; Data Files(*.dat), *.dat; All Files(*.*), *.*;"
QWIN\$MSG_BMPSAVEDLG	"Bitmap Files(*.bmp), *.bmp; All Files(*.*), *.*;"
QWIN\$MSG_INPUTPEND	"Input pending in"
QWIN\$MSG_PASTEINPUTPEND	"Paste input pending"
QWIN\$MSG_MOUSEINPUTPEND	"Mouse input pending in"
QWIN\$MSG_SELECTTEXT	"Select Text in"
QWIN\$MSG_SELECTGRAPHICS	"Select Graphics in"
QWIN\$MSG_PRINTABORT	"Error! Printing Aborted."
QWIN\$MSG_PRINTLOAD	"Error loading printer driver"
QWIN\$MSG_PRINTNODEFAULT	"No Default Printer."
QWIN\$MSG_PRINTDRIVER	"No Printer Driver."
QWIN\$MSG_PRINTINGERROR	"Print: Printing Error."
QWIN\$MSG_PRINTING	"Printing"
QWIN\$MSG_PRINTCANCEL	"Cancel"
QWIN\$MSG_PRINTINPROGRESS	"Printing in progress..."

ID	Message
QWIN\$MSG_HELPNOTAVAIL	"Help Not Available for Menu Item"
QWIN\$MSG_TITLETEXT	"Graphic"

### Description

You can change any string produced by QuickWin by calling SETMESSAGEQQ with the appropriate ID. This includes status messages displayed at the bottom of a QuickWin application, state messages (such as "Paused"), and dialog box messages. These messages can include multibyte characters.

---

## SETWINDOWCONFIG

*Sets the properties of a child window.*

---

### Prototype

```

INTERFACE
  FUNCTION SETWINDOWCONFIG(wc)
    logical SETWINDOWCONFIG
  STRUCTURE /WINDOWCONFIG/
    INTEGER(2) NUMXPIXELS, NUMYPIXELS
    INTEGER(2) NUMTEXTCOLS, NUMTEXTROWS
    INTEGER(2) NUMCOLORS
    INTEGER(4) FONTSIZE
    CHARACTER(LEN=80) TITLE
    INTEGER(2) BITSPERPIXEL
    INTEGER(2) NUMVIDEOPAGES
    INTEGER(2) MODE
    INTEGER(2) ADAPTER
    INTEGER(2) MONITOR
    INTEGER(2) MEMORY
    INTEGER(2) ENVIRONMENT
  END STRUCTURE
END INTERFACE

```



```

        CHARACTER(LEN=32) EXTENDFONTNAME
        INTEGER(4) EXTENDFONTSIZE
        INTEGER(4) EXTENDFONTATTRIBUTES
    END STRUCTURE
    RECORD /WINDOWCONFIG/WC
    END FUNCTION
END INTERFACE

WC          Input. Derived type windowconfig. Contains window
           properties.

TYPE WINDOWCONFIG
    INTEGER(2) NUMXPIXELS    ! Number of pixels on x-axis
    INTEGER(2) NUMYPIXELS    ! Number of pixels on y-axis
    INTEGER(2) NUMTEXTCOLS   ! Number of text columns
                           ! available
    INTEGER(2) NUMTEXTROWS   ! Number of text rows
                           ! available
    INTEGER(2) NUMCOLORS     ! Number of color indexes
    INTEGER(4) FONTSIZE      ! Size of default font. Set
                           ! to QWIN$EXTENDFONT when using
                           ! multibyte characters, in which case
                           ! EXTENDFONTSIZE sets the font size.
    CHARACTER(LEN=80) TITLE ! window title, a C string
    ! The next three parameters support multibyte
    ! character sets (such as Japanese)
    CHARACTER(LEN=32) EXTENDFONTNAME ! any
    ! nonproportionally spaced font available on the
    ! system
    INTEGER(4) EXTENDFONTSIZE ! takes same values as
                           ! FONTSIZE, but used for multibyte
                           ! character sets when FONTSIZE set to
                           ! QWIN$EXTENDFONT
    INTEGER(4) EXTENDFONTATTRIBUTES ! font attributes
                           ! such as bold and italic for
                           ! multibyte character sets
END TYPE WINDOWCONFIG

```

## Description

If you use `SETWINDOWCONFIG` to set the variables in `WINDOWCONFIG` to -1, the function sets the highest resolution possible for your system, given the other fields you specify, if any. You can set the actual size of the window by specifying parameters that influence the window size: the number of x and y pixels, the number of rows and columns, and the font size. If you do not call `SETWINDOWCONFIG`, the window defaults to the best possible resolution and a font size of 8x16. The number of colors available depends on the video driver used.

If you use `SETWINDOWCONFIG`, you should specify a value for each field (-1 or your own value for the numeric fields and a C string for the title, for example, "words of text"C). Using `SETWINDOWCONFIG` with only some fields specified can result in useless values for the unspecified fields.

If you request a configuration that cannot be set, `SETWINDOWCONFIG` returns `.FALSE.` and calculates parameter values that will work and are as close as possible to the requested configuration. A second call to `SETWINDOWCONFIG` establishes the adjusted values; for example:

```
status = SETWINDOWCONFIG(WC)
if (.NOT.status) status = SETWINDOWCONFIG(WC)
```

If you specify values for all four of the size parameters, `NUMPIXELS`, `NUMYPIXELS`, `NUMTEXTCOLS`, and `NUMTEXTROWS`, the font size is calculated by dividing these values. The default font is Courier New and the default font size is 8x16. There is no restriction on font size, except that the window must be large enough to hold it.

Under Standard Graphics, the application attempts to start in Full Screen mode with no window decoration (window decoration includes scroll bars, menu bar, title bar, and message bar) so that the maximum resolution can be fully used. Otherwise, the application starts in a window. You can use `ALT+ENTER` at any time to toggle between the two modes.

Note that if you are in Full Screen mode and the resolution of the window does not match the resolution of the video driver, graphics output will be slow compared to drawing in a window.

## Output

The result type is LOGICAL ( 4 ). The result is .TRUE. if successful; otherwise, .FALSE..

---

## SETWINDOWMENUQQ

*Sets a top-level menu as the menu to which a list of current child window names is appended.*

---

## Prototype

```
INTERFACE
  FUNCTION SETWINDOWMENUQQ (MENUID)
    LOGICAL SETWINDOWMENUQQ
    INTEGER ( 4 ) MENUID
  END FUNCTION
END INTERFACE
```

MENUID            Input. INTEGER ( 4 ). Identifies the menu to hold the child window names, starting with 1 as the leftmost menu.

## Description

The list of current child window names can appear in only one menu at a time. If the list of windows is currently in a menu, it is removed from that menu. By default, the list of child windows appears at the end of the Window menu.

## Output

The result type is LOGICAL ( 4 ). The result is .TRUE. if successful; otherwise, .FALSE..

---

## SETWSIZEQQ

*Sets the size and position of a window.*

---

### Prototype

```

INTERFACE
  FUNCTION SETWSIZEQQ(IUNIT,WINFO)
    STRUCTURE /QWINFO/
      INTEGER(2) TYPE,X,Y,H,W
    END STRUCTURE
    INTEGER(4) SETWSIZEQQ, IUNIT
    RECORD /QWINFO/ WINFO
  END FUNCTION
END INTERFACE

IUNIT      Input. INTEGER(4). Specifies the window unit. Unit
           numbers 0, 5, and 6 refer to the default startup window
           only if the program does not explicitly open them with
           the OPEN statement. To set the size of the frame window
           (as opposed to a child window), set IUNIT to the
           symbolic constant QWIN$FRAMEWINDOW.

WINFO      Input. Derived type qwinfo. Physical coordinates of the
           window's upper-left corner, and the current or maximum
           height and width of the window's client area (the area
           within the frame).

TYPE QWINFO
  INTEGER(2) TYPE ! request type
  INTEGER(2) X    ! x coordinate for upper left
  INTEGER(2) Y    ! y coordinate for upper left
  INTEGER(2) H    ! window height
  INTEGER(2) W    ! window width
END TYPE QWINFO

```

This function's behavior depends on the value of `qwinfo.type`, which can be any of the following:

---

QWIN\$MIN	Minimizes the window.
QWIN\$MAX	Maximizes the window.
QWIN\$RESTORE	Restores the minimized window to its previous size.
QWIN\$SET	Sets the window's position and size according to the other values in qwinfo.

### Description

The position and dimensions of child windows are expressed in units of character height and width. The position and dimensions of the frame window are expressed in screen pixels.

The height and width specified for a frame window reflects the actual size in pixels of the frame window *including* any borders, menus, and status bar at the bottom.

### Output

The result type is `INTEGER ( 4 )`. The result is zero if successful; otherwise, nonzero.

---

## UNREGISTERMOUSEEVENT

*Removes the callback routine registered for a specified window by an earlier call to REGISTERMOUSEEVENT.*

---

### Prototype

```
INTERFACE
  FUNCTION UNREGISTERMOUSEEVENT (UNIT, MOUSEEVENTS)
    INTEGER UNREGISTERMOUSEEVENT, UNIT, MOUSEEVENTS
  END FUNCTION
END INTERFACE
```

UNIT	Input. INTEGER ( 4 ). Unit number of the window whose callback routine on mouse events is to be unregistered.
MOUSEEVENTS	Input. INTEGER ( 4 ). One or more mouse events handled by the callback routine to be unregistered. Symbolic constants for the possible mouse events are:
	MOUSE\$LBUTTONDOWN Left mouse button down
	MOUSE\$LBUTTONUP Left mouse button up
	MOUSE\$LBUTTONDBLCLK Left mouse button double-click
	MOUSE\$RBUTTONDOWN Right mouse button down
	MOUSE\$RBUTTONUP Right mouse button up
	MOUSE\$RBUTTONDBLCLK Right mouse button double-click
	MOUSE\$MOVE Mouse moved

### Description

Once you call UNREGISTERMOUSEEVENT, QuickWin no longer calls the callback routine specified earlier for the window when mouse events occur. Calling UNREGISTERMOUSEEVENT when no callback routine is registered for the window has no effect.

### Output

The result type is INTEGER ( 4 ). The result is zero or a positive integer if successful; otherwise, a negative integer which can be one of the following:

MOUSE\$BADUNIT The unit specified is not open, or is not associated with a QuickWin window.

MOUSE\$BADEVENT  
The event specified is not supported.

---

## WAITONMOUSEEVENT

*Waits for the specified mouse input from the user.*

---

### Prototype

INTERFACE

FUNCTION WAITONMOUSEEVENT(MouseEvents,KeyState,X,Y)

INTEGER WAITONMOUSEEVENT,MouseEvents,KeyState,X,Y

END FUNCTION

END INTERFACE

MOUSEEVENTS    Input. INTEGER ( 4 ). One or more mouse events that must occur before the function returns. Symbolic constants for the possible mouse events are:

MOUSE\$LBUTTONDOWN

Left mouse button down

MOUSE\$LBUTTONUP

Left mouse button up

MOUSE\$LBUTTONDBLCLK

Left mouse button double-click

MOUSE\$RBUTTONDOWN

Right mouse button down

MOUSE\$RBUTTONUP

Right mouse button up

MOUSE\$RBUTTONDBLCLK

Right mouse button double-click

MOUSE\$MOVE

Mouse moved

KEYSTATE        Output. INTEGER ( 4 ). Bitwise inclusive OR of the state of the mouse during the event. The value returned in KEYSTATE can be any or all of the following symbolic constants:

	MOUSE\$KS_LBUTTON	Left mouse button down during event
	MOUSE\$KS_RBUTTON	Right mouse button down during event
	MOUSE\$KS_SHIFT	SHIFT key held down during event
	MOUSE\$KS_CONTROL	CONTROL key held down during event
X	Output. INTEGER ( 4 ).	X position of the mouse when the event occurred.
Y	Output. INTEGER ( 4 ).	Y position of the mouse when the event occurred.

### Description

WAITONMOUSEEVENT does not return until the specified mouse input is received from the user. While waiting for a mouse event to occur, the status bar changes to read "Mouse input pending in XXX" where XXX is the name of the window. When a mouse event occurs, the status bar returns to its previous value.

A mouse event must happen in the window that had focus when WAITONMOUSEEVENT was initially called. Mouse events in other windows will not end the wait. Mouse events in other windows cause callbacks to be called for the other windows, if callbacks were previously registered for those windows.

For every BUTTONDOWN or BUTTONDBLCLK event there is an associated BUTTONUP event. When the user double clicks, four events happen: BUTTONDOWN and BUTTONUP for the first click, and BUTTONDBLCLK and BUTTONUP for the second click. The difference between getting BUTTONDBLCLK and BUTTONDOWN for the second click depends on whether the second click occurs in the double click interval, set in the system's CONTROL PANEL/MOUSE.



## Output

The result type is `INTEGER ( 4 )`. The result is the symbolic constant associated with the mouse event that occurred if successful. If the function fails, it returns the constant `MOUSE$BADEVENT`, meaning the event specified is not supported.

## QuickWin Default Menu Support

These are predefined callback functions, which you can register as callback routines or call directly from your program.

---

## WINPRINT

*Prints the program*

---

### Prototype

```
INTERFACE
  SUBROUTINE WINPRINT()
!MS$ ATTRIBUTES stdcall, alias: '_WINPRINT@0' ::
WINPRINT
  END SUBROUTINE
END INTERFACE
```

### Description

This callback routine calls “Print...” dialog to print or save as bitmap file contents of current active (focused) child window.

---

## WINSAVE

*Saves the program*

---

### Prototype

```
INTERFACE
  SUBROUTINE WINSAVE()
  !MS$ ATTRIBUTES stdcall, alias: '_WINSAVE@0' ::
WINSAVE
  END SUBROUTINE
END INTERFACE
```

### Description

This callback routine calls “Save...” dialog to print or save as bitmap file contents of current active (focused) child window.

---

## WINEXIT

*Terminates the program*

---

### Prototype

```
INTERFACE
  SUBROUTINE WINEXIT()
  !MS$ ATTRIBUTES stdcall, alias: '_WINEXIT@0' ::
WINEXIT
  END SUBROUTINE
END INTERFACE
```

### Description

This callback routine calls “Exit...” dialog to terminate the current active (focused) child window.

---

## WINCOPY

*Copies the selected text and/or graphics from current window to the Clipboard.*

---

### Prototype

```
INTERFACE
  SUBROUTINE WINCOPY()
!MS$ ATTRIBUTES stdcall, alias: '_WINCOPY@0' ::
WINCOPY
  END SUBROUTINE
END INTERFACE
```

### Description

This callback routine copies the selected text and/or graphics from current window to the Clipboard.

---

## WINPASTE

*Pastes clipboard contents (text only) to the current text window of the active window during a READ.*

---

### Prototype

```
INTERFACE
  SUBROUTINE WINPASTE()
!MS$ ATTRIBUTES stdcall, alias: '_WINPASTE@0' :: WIN-
PASTE
  END SUBROUTINE
END INTERFACE
```

### Description

This callback routine pastes clipboard contents (text only) to the current text window of the active window during a READ.

---

## WINSIZETO FIT

*Sizes output to fit window.*

---

### Prototype

```
INTERFACE
  SUBROUTINE WINSIZETO FIT()
  !MS$ ATTRIBUTES stdcall, alias: '_WINSIZETO FIT@0' ::
  WINSIZETO FIT
  END SUBROUTINE
END INTERFACE
```

### Description

This callback routine sizes output to fit window.

---

## WINFULLSCREEN

*Displays output in full screen.*

---

### Prototype

```
INTERFACE
  SUBROUTINE WINFULLSCREEN()
  !MS$ ATTRIBUTES stdcall, alias: '_WINFULLSCREEN@0' ::
  WINFULLSCREEN
  END SUBROUTINE
END INTERFACE
```

---

### Description

This callback routine displays output in full screen.

---

## WINSTATE

*Toggles between pause and resume states of text output.*

---

### Prototype

```
INTERFACE
    SUBROUTINE WINSTATE()
!MS$ ATTRIBUTES stdcall, alias: '_WINSTATE@0' ::
WINSTATE
    END SUBROUTINE
END INTERFACE
```

### Description

This callback routine toggles between pause and resume states of text output.

---

## WINCASCADE

*Cascades active windows.*

---

### Prototype

```
INTERFACE
    SUBROUTINE WINCASCADE()
!MS$ ATTRIBUTES stdcall, alias: '_WINCASCADE@0' ::
WINCASCADE
    END SUBROUTINE
```

```
END INTERFACE
```

### Description

This callback routine cascades active windows.

---

## WINTILE

*Tiles active windows.*

---

### Prototype

```
INTERFACE
  SUBROUTINE WINTILE()
!MS$ ATTRIBUTES stdcall, alias: '_WINTILE@0' ::
WINTILE
  END SUBROUTINE
END INTERFACE
```

### Description

This callback routine tiles active windows.

---

## WINARRANGE

*Arranges icons.*

---

### Prototype

```
INTERFACE
  SUBROUTINE WINARRANGE()
!MS$ ATTRIBUTES stdcall, alias: '_WINARRANGE@0' ::
WINARRANGE
  END SUBROUTINE
```

```
END INTERFACE
```

### Description

This callback routine arranges icons.

---

## WININPUT

---

### Prototype

```
INTERFACE
  SUBROUTINE WININPUT()
!MS$ ATTRIBUTES stdcall, alias: '_WININPUT@0' ::
WININPUT
  END SUBROUTINE
END INTERFACE
```

---

## WINCLEARPASTE

---

*Clears the paste buffer.*

---

### Prototype

```
INTERFACE
  SUBROUTINE WINCLEARPASTE()
!MS$ ATTRIBUTES stdcall, alias: '_WINCLEARPASTE@0' ::
WINCLEARPASTE
  END SUBROUTINE
END INTERFACE
```

**Description**

This callback routine clears the paste buffer.

---

**WINSTATUS**

*Enables a status bar.*

---

**Prototype**

```
INTERFACE
  SUBROUTINE WINSTATUS( )
!MS$ ATTRIBUTES stdcall, alias: '_WINSTATUS@0' ::
WINSTATUS
  END SUBROUTINE
END INTERFACE
```

**Description**

This callback routine enables a status bar.

---

**WININDEX**

*Displays the index for QuickWin Help.*

---

**Prototype**

```
INTERFACE
  SUBROUTINE WININDEX( )
!MS$ ATTRIBUTES stdcall, alias: '_WININDEX@0' ::
WININDEX
  END SUBROUTINE
END INTERFACE
```



---

### Description

This callback routine displays the index for QuickWin Help.

---

## WINUSING

*Displays information on how to use Help.*

---

### Prototype

```
INTERFACE
  SUBROUTINE WINUSING()
!MS$ ATTRIBUTES stdcall, alias: '_WINUSING@0' ::
WINUSING
  END SUBROUTINE
END INTERFACE
```

### Description

This callback routine displays information on how to use help.

---

## WINABOUT

*Displays information about the current QuickWin application.*

---

### Prototype

```
INTERFACE
  SUBROUTINE WINABOUT()
!MS$ ATTRIBUTES stdcall, alias: '_WINABOUT@0' ::
WINABOUT
  END SUBROUTINE
END INTERFACE
```

**Description**

This callback routine displays information about the current QuickWin application.

---

**WINSELECTTEXT**

*Selects text from the current window.*

---

**Prototype**

```
INTERFACE
  SUBROUTINE WINSELECTTEXT( )
    !MS$ ATTRIBUTES stdcall, alias: '_WINSELECTTEXT@0' ::
    WINSELECTTEXT
  END SUBROUTINE
END INTERFACE
```

**Description**

This callback routine selects text from the current window.

---

**WINSELECTGRAPHICS**

*Selects graphics from the current window.*

---

**Prototype**

```
INTERFACE
  SUBROUTINE WINSELECTGRAPHICS( )
    !MS$ ATTRIBUTES stdcall, alias: '_WINSELECTGRAPHICS@0' ::
    WINSELECTGRAPHICS
  END SUBROUTINE
END INTERFACE
```

### Description

This callback routine selects graphics from the current window.

---

## WINSELECTALL

*Selects the entire contents of the current window.*

---

### Prototype

```
INTERFACE
  SUBROUTINE WINSELECTALL()
!MS$ ATTRIBUTES stdcall, alias: '_WINSELECTALL@0' ::
WINSELECTALL
  END SUBROUTINE
END INTERFACE
```

### Description

This callback routine selectsthe entire contents of the current window.

---

## NUL

*No callback routine.*

---

### Prototype

```
INTERFACE
  SUBROUTINE NUL()
!MS$ ATTRIBUTES stdcall, alias: '_NUL@0' ::  NUL
  END SUBROUTINE
END INTERFACE
```

**Description**

This is a no callback routine. It denies the use of a callback routine.

**Unknown Functions**

---

**GETACTIVEPAGE**

---

**Prototype**

```
INTERFACE
  FUNCTION GETACTIVEPAGE ( )
    INTEGER ( 2 ) GETACTIVEPAGE
  END FUNCTION
END INTERFACE
```

---

**GETTEXTCURSOR**

---

**Prototype**

```
INTERFACE
  FUNCTION GETTEXTCURSOR ( )
    INTEGER ( 2 ) GETTEXTCURSOR
  END FUNCTION
END INTERFACE
```

---

## GETGTEXTVECTOR

---

### Prototype

```
INTERFACE
    SUBROUTINE GETGTEXTVECTOR(X,Y)
!MS$ ATTRIBUTES stdcall, ALIAS:"__f_getgtextvector@8"
:: getgtextvector
        INTEGER(2) X,Y
!MS$ ATTRIBUTES REFERENCE :: X
!MS$ ATTRIBUTES REFERENCE :: Y
    END SUBROUTINE
END INTERFACE
```

---

## GETHANDLEQQ

---

### Prototype

```
INTERFACE
    FUNCTION GETHANDLEQQ(IUNIT)
        integer*4 GETHANDLEQQ, IUNIT
    END FUNCTION
END INTERFACE
```

---

## GETVIDEOCONFIG

---

### Prototype

```
INTERFACE
  SUBROUTINE GETVIDEOCONFIG(s)
    STRUCTURE /VIDEOCONFIG/
      INTEGER(2) NUMXPIXELS ! number of pixels on X axis
      INTEGER(2) NUMYPIXELS ! number of pixels on Y axis
      INTEGER(2) NUMTEXTCOLS ! number of text columns
                           ! available
      INTEGER(2) NUMTEXTROWS ! number of text rows
                           ! available
      INTEGER(2) NUMCOLORS  ! number of actual colors
      INTEGER(2) BITSPERPIXEL ! number of bits per pixel
      INTEGER(2) NUMVIDEOPAGES ! number of available
                           ! video pages
      INTEGER(2) MODE        ! current video mode
      INTEGER(2) ADAPTER     ! active display adapter
      INTEGER(2) MONITOR     ! active display monitor
      INTEGER(2) MEMORY      ! adapter video memory in
                           ! K bytes
    END STRUCTURE
    RECORD /VIDEOCONFIG/ S
    !MS$ ATTRIBUTES REFERENCE :: S
  END SUBROUTINE
END INTERFACE
```

---

## GETVISUALPAGE

---

### Prototype

```
INTERFACE
  FUNCTION GETVISUALPAGE( )
    INTEGER(2) GETVISUALPAGE
  END FUNCTION
END INTERFACE
```

---

## REGISTERFONTS

---

### Prototype

```
INTERFACE
  FUNCTION REGISTERFONTS(FILENAME)
    INTEGER(2) REGISTERFONTS
  !MS$ ATTRIBUTES ALIAS:"__ILf_registerfonts" ::
  REGISTERFONTS
    CHARACTER(LEN=*) FILENAME
  !MS$ ATTRIBUTES REFERENCE ::    FILENAME
  END FUNCTION
END INTERFACE
```

---

## SELECTPALETTE

---

### Prototype

```
INTERFACE
  FUNCTION SELECTPALETTE (NUMBER)
    INTEGER (2) SELECTPALETTE, NUMBER
  END FUNCTION
END INTERFACE
```

---

## SETACTIVEPAGE

---

### Prototype

```
INTERFACE
  FUNCTION SETACTIVEPAGE (PAGE)
    INTEGER (2) SETACTIVEPAGE, PAGE
  END FUNCTION
END INTERFACE
```



---

## SETFRAMEWINDOW

---

### Prototype

```
INTERFACE
  SUBROUTINE SETFRAMEWINDOW(X,Y,WIDTH,HEIGHT)
    INTEGER X,Y,WIDTH,HEIGHT
  END SUBROUTINE
END INTERFACE
```

---

## DSETGTEXTVECTOR

---

### Prototype

```
INTERFACE
  SUBROUTINE DSETGTEXTVECTOR(X,Y)
    INTEGER(2) X,Y
  END SUBROUTINE
END INTERFACE
```

---

## SETSTATUSMESSAGE

---

### Prototype

```
INTERFACE
  SUBROUTINE SETSTATUSMESSAGE(MSG, ID)
    CHARACTER(LEN=*) MSG
!MS$ ATTRIBUTES reference :: MSG
    INTEGER(4) ID
  END SUBROUTINE
END INTERFACE
```

---

## SETTEXTCURSOR

---

### Prototype

```
INTERFACE
  FUNCTION SETTEXTCURSOR(ATTR)
    INTEGER(2) SETTEXTCURSOR, ATTR
  END FUNCTION
END INTERFACE
```

---

## SETTEXTFONT

---

### Prototype

```
INTERFACE
  SUBROUTINE SETTEXTFONT (FONTNAME)
!MS$ ATTRIBUTES ALIAS:"__ILf_settextfont" ::
SETTEXTFONT
    character*(*) FONTNAME
!MS$ ATTRIBUTES REFERENCE ::    FONTNAME
  END SUBROUTINE
END INTERFACE
```

---

## SETTEXTROWS

---

### Prototype

```
INTERFACE
  FUNCTION SETTEXTROWS(ROWS)
    INTEGER(2) SETTEXTROWS,ROWS
  END FUNCTION
END INTERFACE
```

---

## SETVIDEOMODE

---

### Prototype

```
INTERFACE
  FUNCTION SETVIDEOMODE(MODE)
    INTEGER(2) SETVIDEOMODE,MODE
  END FUNCTION
END INTERFACE
```

---

## SETVIDEOMODEROWS

---

### Prototype

```
INTERFACE
  FUNCTION SETVIDEOMODEROWS(MODE,ROWS)
    INTEGER(2) SETVIDEOMODEROWS
    INTEGER(2) MODE,ROWS
  END FUNCTION
END INTERFACE
```

---

## SETVISUALPAGE

---

### Prototype

```
INTERFACE
  FUNCTION SETVISUALPAGE(PAGE)
    INTEGER(2) SETVISUALPAGE,PAGE
  END FUNCTION
END INTERFACE
```

---

## UNREGISTERFONTS

---

### Prototype

```
INTERFACE
  SUBROUTINE UNREGISTERFONTS()
  END SUBROUTINE
END INTERFACE
```

## Access to Windows Handles for QuickWin Components

---

### GETHANDLEFRAMEQQ

---

#### Prototype

```
INTERFACE
  FUNCTION GETHANDLEFRAMEQQ ( )
    INTEGER(4) GETHANDLEFRAMEQQ
  END FUNCTION
END INTERFACE
```

---

### GETHANDLECLIENTQQ

---

#### Prototype

```
INTERFACE
  FUNCTION GETHANDLECLIENTQQ ( )
    INTEGER(4) GETHANDLECLIENTQQ
  END FUNCTION
END INTERFACE
```

---

## GETHANDLECHILDQQ

---

### Prototype

```
INTERFACE
  FUNCTION GETHANDLECHILDQQ(QUICKHND)
    INTEGER(4) GETHANDLECHILDQQ
    INTEGER(4) QUICKHND
  END FUNCTION
END INTERFACE
```

---

## UNUSEDQQ

*Used to avoid "unused" warnings*

---

### Prototype

```
INTERFACE
  SUBROUTINE UNUSEDQQ( )
    !MS$ ATTRIBUTES
    C,REFERENCE,VARYING,ALIAS:"__FFunusedqq"::UNUSEDQQ
  END SUBROUTINE
END INTERFACE
```

### Description

Unused routine: simply returns; used to avoid "unused" warnings.





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---

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